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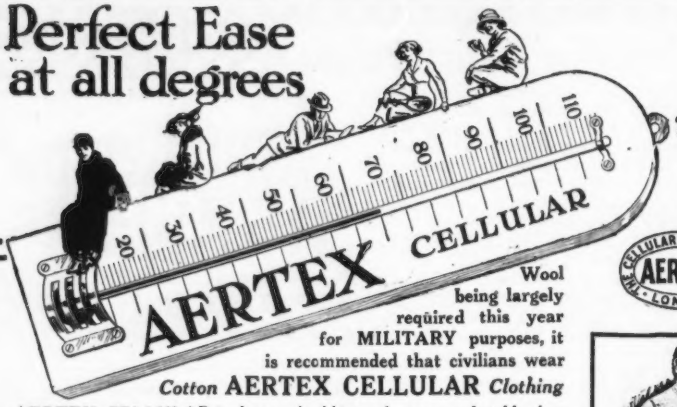

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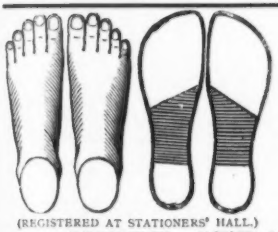

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Geographical Journal.

No. 6. DECEMBER, 1915. Vol. XLVI.

ADDRESS OF THE PRESIDENT, DOUGLAS W. FRESHFIELD, AT THE OPENING OF THE SESSION, 15 NOVEMBER, 1915.

It has been an intermittent practice with your Presidents to refer to the incidents of the Long Vacation at the first meeting of the new session. It is a practice not, in my judgment, without its disadvantages, for it may tend either to duplicate or to interfere with the completeness of the formal Annual Address in May. To-night I shall be brief.

I shall do no more than mention the serious loss the Council has sustained by the death of two of its members, Sir Claude Macdonald, late H.M.'s ambassador at Tokio, and Prof. Herbertson, the head of the Oxford School of Geography. Fuller tributes to them have already been paid in the *Journal*.

I need only refer to the fact that there has been no falling off, but on the contrary a considerable increase, in the amount of the work for the War Office and Admiralty that is being done in the Society's house by a large and zealous staff.

Our programme for the coming session is in part before you. It reflects the character of the epoch we are passing through; and if it differs from what we are accustomed to it need not on that account be less interesting.

There is one other point I would touch on. At a time like the present your Council look with anxious eyes on the statistics of our membership. War must naturally tend to interrupt its normal increase, both by reducing the number of candidates for election and by adding to the number of deaths and resignations. It is with satisfaction therefore that I am able to state that the national crisis has done little more to our numbers than to arrest their growth. Our losses by death and resignation will not, I trust, exceed by more than thirty or forty the

number of new members who will have joined us this year. These figures speak well for the patriotism and the good sense of our Fellows.

I mention patriotism, for economy is in the air; it is preached everywhere and practised in most places—except, perhaps, some Government departments. But it is a false economy that would try to dispense with necessaries, and our Society at the present moment is in more ways than one a necessary for the nation.

To have at hand, collected and collated, and ready for use, a store of geographical facts as to any possible seat of war; to cultivate the habit of mind—the sense of country, the geographical attitude—that can reason and act promptly on such facts, are obvious conditions of military and naval success. In these matters of practical and mental equipment we are doing more from month to month to help the State. We thus perform a function that in the present crisis is essential. It will not be less essential when the time comes for framing and dictating terms of peace.

The maintenance of a Society whose work is to make us all think geographically is a national economy.

THE SOUTHERN FRONTIERS OF AUSTRIA.*

By DOUGLAS W. FRESHFIELD, President.

HISTORIANS and poets, amongst others, Livy, Tacitus, and Petrarch, have apostrophized the Alps as the citadel or the rampart of Italy. But this claim is surely inconsistent with the facts. In the earliest times of which we have any record the Gauls, Livy tells us, had already crossed the Western Alps and dwelt on both sides of them. The plains of the Po were known to the Romans as Gallia Cisalpina. It was the Apennine, running transversly across the peninsula from the Gulf of Genoa to where the slender stream of the Rubicon trickles into the Adriatic, that was for centuries both the real and official limit of Italy. Its invaders from the north, from Hannibal and Hasdrubal to Francis I. of France and Napoleon, found ways over the Alps for their armies. In modern history the same state has at many times and in many places held the country on either side of the mountains. To take only one or two of the most conspicuous examples, we find in the past the Holy Roman Empire, Burgundy, and the dominions of the House of Savoy, at the present day Switzerland and Austria, disregarding the Alpine watershed in their political boundaries.

One reason for the failure of the Alps to serve as a protection to Italy from northern invasions may be found in the fact that, since the fall of the Roman Empire, the Italians have seldom been masters of the southern approaches to their crest. A mountain region—the Alps are no

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* Royal Geographical Society, November 15, 1915. Maps, p. 492

single range—may serve, at any rate temporarily, as a good defence to those who hold it strongly up to the summit ridge. The Alps are proving so now in the case of Austria. But if you hold only the lower slopes on one side it may be more of a snare than a support. In popular estimation the importance of mountains in warfare has been exaggerated; they play as a rule but a secondary part, and mostly a preliminary one. The decisive battles of history, as many strategists have pointed out, are fought in the plains.

To-night, however, my task is not to deal with the Alps as a whole but with the portion of them that serves as the political frontier of Austria, the mountains that stretch from the easternmost wedge of Switzerland to the head of the Adriatic. In its western section the Austro-Italian frontier, as at present defined, coincides roughly with the southern limits of the former Prince-bishopric of Trent. This district, properly known as the Trentino, has (with a disregard of ethnological, linguistic, and historical facts the motives of which are obvious) been renamed by Austrian officialism, "Süd-Tirol." I shall next say something of the continuation of the frontier eastwards through the Carnic Alps, the range that overlooks the flats of Friuli. Of all this country I can speak with more or less of personal knowledge. With the Trentino, in particular, I have been familiar in all its recesses for the last half-century. It is fifty-one years since I was one of the first party to reach its highest peak, the Presanella (11,800 feet), anticipating by a few weeks our Gold Medalist, the late Julius Payer of Arctic fame. Payer described his own work in the then unmapped Adamello and Ortler districts in more than one article in *Petermann's Mitteilungen*.

In 1875 I published a volume named 'Italian Alps,' which dealt in great part with the fascinating valleys and fantastic peaks of this, the most beautiful of the many beautiful thresholds of Italy.

Politically my title 'Italian Alps' was no doubt incorrect, though we trust it will not long remain so. But for the sake of any one who may be inclined to dispute its geographical accuracy I will quote the reasoned opinion of that high authority, the late Dr. Ratzel, of Leipzig. The following are the sentences in which he summarizes his views:—

"It must not be overlooked that the Swiss Central Alps are not flanked by a developed South Alpine system such as that which first rises to importance in the Bergamasque Alps. This constitutes a distinct Italian Alpine land, which extends through the Brescian, Vicentine, and Venetian Alps to the western slopes of the Julian Alps. The Western Alps Italy shares with France; the Central Alps with Switzerland; the Southern Alps, where they stand out as an independent group, are wholly Italian" ("Ganz Italienisch").

Yes; Italian they are, and their peculiar charm lies in the combination they display of Italian space and serenity with Alpine grandeur. There is a delightful element of surprise when the wide harmonious sweep

of the landscape is interrupted by the strange shapes of the spires and obelisks that suddenly surge up above the lower hills. The eyes of the traveller, in place of being confined between two mountain walls, wander out into great distances, over wide expanses, and his imagination follows them to recall past rambles, or anticipate fresh adventure.

The district south of the Ortler group, the country between the Stelvio Pass and Botzen on the north and Brescia and Verona on the south is, I repeat, from the picturesque point of view one of the most varied and fascinating districts in the Alps. Its charm is due not so much to the height of its peaks, which do not quite reach 12,000 feet, as to their variety; granite walls and glacier curtains facing dolomitic towers and pinnacles of the strangest forms. At the feet of the mountains lie open valleys rich in all the luxuriance of southern foliage and studded with prosperous villages; it is a land of maize and vines, of fertile slopes linked by wild gorges through which the rivers cut a devious way for themselves out of the mountains. Seen from any moderate eminence the hilltops compose instead of confining and bounding the landscape; they spread out their broad backs to the sunshine instead of cutting it off. In place of striking against one predominant range our gaze sweeps across twenty surging ridges and wanders in and out of a hundred hollows, distinct or veiled according as the sun or shadow falls on them, until it meets on the horizon the snows of the Adamello or the spires of the Dolomites.

I must deal more in particular with the chief features of this district—the Western Trentino.

East of the Lake of Como, extending as far as the junction of the Adige and the Eisack at Botzen, a continuous range, roughly parallel to the watershed of the Alps, separates the two longitudinal valleys of the Adda and the Upper Adige (the Vintschgau) from the waters flowing more directly to the Lombard plain. Beginning in the Bergamasque Alps this water-parting is continued in the great spurs of the Ortler group. But south of this range and east of Lago d'Iseo the eyes rest on three lofty ridges, running transversely to the general trend of the Alps, running, that is, north and south. The western ridge, separated from the mountains behind and north of it by the depression of the Tonale Pass, culminates in the Adamello group, a noble mass of snow and ice with glaciers 12 miles broad, crowned by three peaks of over 11,000 feet, the southernmost outposts of the Eastern Alps. From their summits the climber looks west to the far-off Monte Viso and away south over the battlefield of Solferino to "the line of the olive-sandalled Apennine."

This crest, gradually falling in height till it sinks into the plain near Brescia, forms the boundary between the Trentino and Lombardy. The only carriage road over it is that of the Tonale Pass, obviously a point of high strategic value.

Immediately south of the Tonale and Val di Sole, and in the very

heart of the Adamello group, lies one of the noblest of the high valleys of the Alps, the Val di Genova. In glaciers and precipices it rivals the vale of Lauterbrunnen, in waterfalls and primæval forests it surpasses its Swiss rival. Rising in true granitic fashion in successive steps it presents at each step a waterfall in addition to those that pour down its sides from hidden icefields. It is in its whole length without a village or permanent inhabitants; the only dwellings until a few years ago were the summer chalets, which in this region still retain the classical name of mandra or mandrone. In winter it is left to the bears, who were a few years ago fairly numerous. An old hunter whose exploits are recorded by Payer boasted of having slain 20 bears and 350 chamois.

According to local legend, as recorded in the Year-book of the Trentino Alpine Club, the Council of Trent availed itself of this mountain fastness as a place of banishment for the witches of the countryside. The familiar spirits with whom they had been on good terms did not desert their friends, and the neighbourhood was reputed to be infested by lively young devils, invisible by day but apt to break out at night on the belated hunter or herdsman who lingered too long in their haunts.

"Tempora mutantur, nos et mutamur in illis."

In the last twenty years the devils have disappeared, driven away by the members of the Leipzig branch of the German Alpine Club which has erected a substantial hut, or rather barrack, at the head of the valley. This has been used by the Austrians as a base in attempts (of which more hereafter) to turn the Tonale.

Between the Adamello range and the Lower Adige we find two parallel troughs and two ridges, all running north and south. There is the ridge of the Brenta Group, starting from the south side of Val di Sole, culminating in the fantastic dolomite crags of the Cima Tosa (10,420 feet) and its neighbours, and stretching down to Salo on Lago di Garda. It is broken in two places, by the formidable gorges of the Sarca, and, further south, by the hollow in which nestles the charming little Lago di Ledro, a Cumberland tarn transported to Italy. But this latter gap is ineffectual for strategic aims, for it is closed by the abrupt precipices that fall on the head of Lago di Garda behind Riva. Still further east and immediately overhanging the trough of the Adige the long ridge of Monte Baldo (7210 feet), precipitous on its eastern side, reaches from the gorge that gives access to Val di Non down to Verona. It is, however, crossed by a railway and two carriage roads through narrow passes strongly fortified.

But it is not until we come to consider the drainage system of the district, and its distinctive and singular feature, the zigzag course of the Sarca, that we shall fully realize the nature of the obstacles that meet an invader who wants to get to the Adige valley and Trent. It may be relatively easy for a force advancing from the south to penetrate the Giudicaria over the low watershed that separates the Chiese and the Sarca, but it finds no sure means of progressing eastward.

Of the two troughs the western has at its head the broad meadows of the Campo di Carlomagno which afford easy access to Val di Sole. Through its middle portion, Val Rendena, a sunny vale clothed in maizefields and chestnut woods and sprinkled with prosperous villages, runs the Sarca, until at Tione the river turns east and the natural course of the valley is interrupted by a low hill (2280 feet), on the other side of which the stream of the Chiese flows to Lago d'Idro and the plain through a district known as the Giudicaria from certain rights granted by the Bishops of Trent to its inhabitants. The eastern trough, also open at its head behind the Lake of Molveno—a spot some day to be frequented for the sake of the view of the Brenta dolomites reflected in its bright waters—receives the Sarca on its exit from the gorges and leads it past Arco to the Lago di Garda, there to be reformed from a mountain torrent into the smooth-flowing Mincio.

Now you may grasp why an invader attacking the Trentino from the west must strike north or south of the Adamello glaciers by the Tonale or the Giudicaria. If he takes the Tonale he is liable to be attacked in flank from the broad uplands in which the two troughs end, at Campiglio and Molveno, or to be checked later on in the narrow defile where the Noce issues into the Adige valley.

If he comes up from Brescia by Val Ampola past Lago d'Idro the low water-parting between him and the upper Sarca is insignificant, but his way east is more or less barred by the precipices that overhang Riva, and further up by the defiles of the Sarca. And then, even if master of the head of Lago di Garda, he has in front of him the high and steep crest that rises immediately west of the Adige valley and cuts him off from Trent and Rovereto.

There seem to me, therefore, to be substantial reasons for no serious invasion of the Trentino having been as yet undertaken from this quarter. The Italian aim, except near the head of Lago di Garda, where they have apparently got possession of the Ledro and Riva-Mori gaps, would seem to be limited to occupying a certain number of the enemy's troops by glacier incursions which, if they are not very serious war, are certainly magnificent.

Before I go further I must deal with the frontier question, and here I must ask your attention to the maps, on which are shown (1) the present boundaries of the Trentino; (2) the new boundary claimed by the Italian Government in Baron Sonnino's despatch of April 8 last; (3) that offered in reply on behalf of Austria by Baron Burian; and (4) the boundary claimed on popular Italian maps.

For the last hundred years the Austrian Government has no longer recognized "the Trentino" as a political expression. The former territory of the Bishopric has been merged in a district of South Tyrol,* including

* I adhere to the form Tyrol for the reasons given in the note to my book 'The Italian Alps,' which still seem to me good. Mr. Coolidge, a sound authority, supports this view against his editor in the *Encyclopædia Britannica*.

the portion of Tyrol lying south of the alpine watershed, with the towns of Botzen, Meran, Brixen, and Brunecken.

In the recent negotiations the official Italian claim was a frontier running along the eastern spur of the Ortler group to a point above the Adige halfway between Meran and Botzen. Here it crossed the valley and ran across the uplands that lie in the fork between the Adige and the Eisack, a region of broad pastoral hills and farmhouses with the wide thatched roofs made familiar to us by Titian's drawings. The line crossed the Eisack at Klausen, a name significant of an important strategic fact, and then ran up the ridge south of the Grödnerthal. Approaching near the Falzarego Pass the present frontier, it diverged from it again to give the Ampezzo district, Cortina and its surroundings, to Italy.

The merits of this frontier, from the Italian point of view, are obvious. It gives the command of the entrance to the Vintschgau, the valley of the Upper Adige, and also, and more important, of the gorge of the Eisack at Klausen with the issue of the Brenner and Pusterthal railways. It is, moreover, identical with the frontier of the Bishopric from A.D. 1106 to the date of the Reformation, and with that which recommended itself to Napoleon in 1810 as the limit of his kingdom of Italy.

East of the Tagliamento a new frontier, giving to Italy a line beyond the Isonzo, Gorizia and Gradisca, with the approaches to Trieste, was demanded. This line is shown in detail on my map.*

In the substitute finally offered by Austria † (a slight advance on a previous proposal) the frontier line deviated from the eastern spur of the Ortler at the Illmenspitze, some 16 miles from Monte Cevedale, and ran down south along a tributary of the Noce to that river, which it followed nearly to its junction with the Adige. East of the Adige it followed with minor deviations the ridge west of the Avisio to the Latemar, then crossing Val Fiemme below Moena, ran south of Val di San Pellegrino to abut on the old frontier just north of Paneveggio and the peaks of Primiero. By this proposal Austria would have retained an outpost only 12 miles north of Trent, and would have commanded not only the upper valleys of the

* There are several serious mistranslations in the English version of Baron Sonnino's despatch of April 8, 1915. The note to Article 1 should be translated as follows: "The new frontier leaves the existing frontier at Monte Cevedale; follows at first the spur between Val Venosta (the Vintschgau) and Val di Noce (the Nonsberg), then descends on the Adige at Gargazone between Meran and Botzen, reascends on to the high ground on its left bank, cuts in half Val Serentina (Sarnthal), and the valley of the Isarca (Eisack) at La Chiusa (Klausen), and running through the dolomitic district on the right bank of the Avisio, so as to leave out the Gardona (Grödnerthal) and Badia (Abteithal) valleys, but to include the Ampezzo valley, rejoins the existing frontier." I have inserted the German local names.

In Article 2, in place of "the track of the Chiappovano" read "the hollow." The Chiappovano is a waterless glen (see Ball's 'Alpine Guide').

† See Italian Greenbook, p. 93. This differs substantially from the terms stated and guaranteed by the German Chancellor on May 18, 1915. These are correctly quoted by Mr. Buchan in his 'History of the War,' Vol. 7.

Adige and Eisack but also the entrance to the Val di Non and the route of the Tonale Pass. The line corresponds roughly with the frontier of the Bishopric previous to the twelfth century. Austria further refused to give up the Fassa and Ampezzo districts, or to make any rectification of frontiers in the Carnic Alps.

According to the popular Italian claim, drawn on the principle that the basins of all the streams that flow into the Adriatic should belong to Italy, the frontier would run from the Malser Heide (4596 feet), one of the lowest, and also one of the most frequently overlooked of Alpine passes, along the icy crests of the Ötzthaler and Stubaier Ferner to the Brenner, and then along the Tauern ridge past the Gross Venediger to the Drei Herrn Spitze; there it would turn sharply south along the low bank that divides the sources of the Eisack and the Drave and gain the ridge of the Carnic Alps, henceforth the water-parting between the Adriatic and the Black Sea. I may mention that a German writer after careful inquiry can find no historical connection for the name Venediger. It occurs for the first time in a document of 1797. The story that Venice can be seen from the top is quite groundless.

These various frontiers illustrate very aptly a subject we discussed here last session, the difficulties involved in any decision as to what is a practical and expedient frontier. How in the case of the Trentino are physical, linguistic, racial, commercial, and strategic considerations to be reconciled?

The watershed of the Alps may seize on popular imagination as the ideal natural frontier. The Vetta d'Italia the Italians call it, and they may quote Dante's

> "... l'Alpe che serra Lamagna
> Sopra Tirallo,"

for Schloss Tyrol which gave its name to the country stands north of Meran. But in this region it altogether fails as a racial and linguistic one. In the main, and with one important exception, the boundary suggested by Baron Sonnino is a racial and linguistic frontier.* The village names of Welsch Metz and Deutsch Metz may seem to indicate the true line of racial division in the Adige valley. But the late John Ball, a high authority in these parts, asserts in 'The Alpine Guide,' and more recent authorities confirm the statement, that the tide of Italian emigration has flowed upwards to the vicinity of Botzen. Botzen itself, however, though from A.D. 1106 to the middle of the sixteenth century it formed part of the Bishopric of Trent, is undoubtedly Teutonic in its language and its architecture, if not in its landscape. I note in passing that Baron Burian on April 30 last made to the Italian ambassador the remarkable statement

* See, for figures of the proportion of the Italian and German population in the Trentino in 1910 taken from the official census, the Postscript, p. 433.

that the population of Val Fassa and Ampezzo was "not Italian but Ladinian, and attached to Austria with all the strength of its soul." But Ladinian—a race and dialect akin to the Romansch of Graubünden—has no Teutonic affinity; and as to "soul"—well, perhaps our enemies are hardly in a position to ask us to accept their judgment on questions of soul.

The Ampezzo district, if once Ladin, is now practically Italian. Mr. Ball wrote, "The narrow glen that holds the Toblacher See serves as a portal between German Pusterthal and the Italian population of Ampezzo." That Cortina has of late years been tied to Austria by such bonds as are created by a crowd of hotel-keepers and tourists is undeniable. But these bonds are surely of the pocket rather than of the soul!

As to the political sentiments of the population of the Trentino a Swiss writer may be allowed to be a fairly impartial witness. "The South Tyrolese," writes Dr. Walder, "incline to Italy; their aspirations for self-government are notorious, and they have for years directed their efforts with the aim to be constituted a separate province, apart from North Tyrol. A great portion of the population, like that of Trieste and the coast territory, favours Irredentism, that is annexation to Italy." *

Since in 1866 a sudden armistice snatched, or seemed to snatch, this region out of the grip of the advancing Italians when their forces were within a few miles of Trent, the Trentino has been the most keenly coveted portion of "Italia irredenta." Its population has reciprocated the national sentiment. Their feeling found various and sometimes ingenious ways of expression. A nameless peak was called Cima Roma. In vain did the Austrian engineers try to fix the title of Kaiser Franz Josef Spitze on the Cima Brenta, one of my first ascents in the Dolomites west of the Adige. Caustic was the local criticism when the foreign surveyors turned "Vallesinella" into Val Asinella, "the valley of the little donkey."

Before I proceed to deal with the fighting of the last five months I would say a few words as to the history of the Trentino and the ways of traffic running through it. These high valleys of the Alps were subdued by Drusus, a feat commemorated by Horace. Val di Non still recalls the "Nauni feroces" of the well-known ode. The Antonine Itinerary mentions the Roman road from Trent to Innsbruck, the Brenner. The Bishopric of Trent was severed from Italy A.D. 1027, and transferred to the empire by Conrad II. Its double character, imperial politically, Italian nationally, coupled with its convenient position on a great highway, earned for Trent the distinction of being the seat of the famous Council.

In all ages the Trentino, the southern approach to the Brenner, has been a channel of communication between the regions north and south—Central Europe and Mediterranean Europe—as well as a frontier-land. As a pass the Brenner had many recommendations. The gap it crosses is broad, easy, and below the tree-level (4490 feet). It is open for many

* *Jahrbuch des Schweizer Alpenclub*, vol. 38.

months to wheel traffic. The pass was traversed by armies no less than forty-three times between A.D. 951 and 1251. Frederick I. crossed it three times in October. De Saussure, in one of his letters expressing a fear that Mt. Cenis might be impassable owing to the early season, writes of the Brenner as the obvious alternative, ignoring all the Swiss passes. Again, owing to the configuration of the Eastern Alps, the multitude of their parallel ridges running east and west, it is the last pass towards the east by which the mountain region can be traversed by crossing a single ridge. But in early times, before roads were made, this counted for less, as a gorge might often be more of an obstacle than a reasonable hill, and for travellers who took this view the Brenner had an attraction in the number of bye-routes that branched from it on either side. If up to the fourteenth century and the construction of the Kuntersweg the defile of Klausen above Botzen was a formidable hindrance to traffic, the merchants of Nuremberg and Augsburg could find other paths for their pack-horses. They may have had a further reason for avoiding the main valleys of the Inn, the Eisack, and the Adige. One of the great hindrances to travel on all the Alpine passes was the number of the tolls levied by the owners of the castles that lined the road. A circuit through the remoter vales might in many cases be preferable to the highway. For those who did not mind a double hill there were on the north the Arlberg and the passes of the Bavarian Alps. On the south from Sterzing travellers might cross over the Jaufen Pass (now a carriage road) and descend through the Passeyer Thal to Meran, and then go on by Val di Non and the Tonale, or through Val Rendena and the Giudicaria, to Brescia or Milan. Or from Brixen they might turn left up the Pusterthal and go through Ampezzo by the Strada d'Allemagna to Belluno and Venice, or from Trent they could pass by Val Sugana and through Bassano and Castelfranco to the City in the Sea. The Hospices of Campiglio and San Martino are relics of one of these byeways of commerce.

Holy Roman Emperors took these hill-roads from time to time. In the twelfth century Barbarossa, later Maximilian, marched past Edolo and down through the Val Camonica to Lago d'Iseo. Dante, the destruction of whose statue at Trent has furnished yet another illustration of Teutonic *Kultur*, mentions Val Camonica and writes of the thousand streams that flow down from the Alps between it and Garda, to lose their waters in the great lake and re-issue from it as the Mincio. That lovely lake, Lago d'Iseo, has fallen out of fashion since Lady Mary Wortley Montagu lived at Lovere, celebrated its beauties, and compared the landscape (oddly enough) with that of Tunbridge Wells. But it has a rustic charm which is lacking to the bedizened loveliness of Como. At its head the glaciers of the Adamello look down on arcaded towns, villages with landing-places aglow with oleanders, and hills wrapped in fold on fold of chestnut forest. According to a legend, supported I fear by no contemporary evidence, but embodied in at least three local

inscriptions copied in the sixteenth century from earlier records, a greater than Barbarossa, Charles the Great, once took this way. These inscriptions are found at the church of San Stefano in Val di Genova, at Monno in Val Camonica, and at Monte Cala near the head of the Lago d'Iseo. They pretend to record with much picturesque and circumstantial detail how the emperor with his knights and a train of bishops marched through the mountains, destroyed the castles of the robber-chiefs (*pagans* they are called —Arians?) and converted them by violence to the true faith. The story finds some confirmation in the name Campo di Carlo Magno given to the pastures at the head of Val Rendena. Dr. Scheffel, who has studied the original authorities, is of opinion that they contain no evidence necessarily destructive of a tale one would willingly believe.

I will now examine some of the fighting in its local detail. The northernmost point at which the frontiers of Italy and Austria meet, the only point from which Italy looks down on the sources of the Adige, is the Stelvio Pass (9056 feet), the highest carriage-pass in the Alps. But for political considerations this pass would never have come into use. The Wormser Joch, which is close beside it, is 800 feet lower, and less steep. When historical writers refer to the passages of German or Italian princes over the Stelvio they may be taken, as a rule, to mean the lower pass. Even Mr. Buchan, in the seventh volume of his excellent 'History of the War,' falls into this mistake with regard to a French army in 1799. The Wormser Joch (8242 feet) leads to the portion of the Münsterthal that is Swiss territory. Hence when Austria wanted a direct access to Milan she made in 1828–29 the Stelvio road, which climbs in endless zigzags in full view of the noble front of the Ortler Spitze. The Wormser Joch remained a mule-path until A.D. 1900.

The frontiers in this region have, from a geographical point of view, got badly mixed. Switzerland has stolen from Val Tellina the Poschiavo valley; in the pastoral basin of Livigno, a branch of the Inn valley, Italy holds her largest slice of territory north of the Alps, while in her turn Switzerland has got a bit of the Münsterthal with a source of the Adige.

The Stelvio is of little military use to an invader who does not hold both sides of it. The gorge above the famous Baths of Bormio (mentioned in Leonardo da Vinci's notebooks) supplies Italy with a defensible barrier; the steep zigzags of the eastern slope can easily be made impracticable to an armed force.

On the summit ridge the beginning of the war found the Austrians firmly planted. From this point round to the Gavia Pass 20 miles or more of continuous glacier clothe a crest, the gaps in which do not fall below 10,000 feet. In old warfare glaciers kept their terrors for soldiers. Although many of the roughest mule-tracks in the Alps were crossed at the most inclement seasons of the year, we hear little of glacier passes even in the fierce mountain fighting of the Napoleonic wars. But in the

present war, the spread of mountaineering, the introduction of the ski, brought from Norway to Central Europe, and the systematic training both in France and Italy of Alpine regiments, have led to constant fighting above the snow-level. The troops on both sides have put to use the skill learnt in frequent mountain manœuvres. In the Ortler group there is hardly one of the passes invented in the last fifty years by climbers which has not been made use of by these intrepid military raiders.

The Italians starting from Val di Zebru, a side-glen of Val Tellina, have skirted over peaks of 11,000 feet, making what the Germans call a Grat-wanderung or crest-climb, assailed the Austrians on the top of the Stelvio, and destroyed a climbers' hut under the south ridge of the Ortler. The Austrians have crossed the great glaciers east and west of Monte Cevedale, starting both from Val dei Monti and the Martellthal, and assailed the Italian outposts in Val Cedeh at the foot of the Königspitze. But these "excursions" and "alarms," however adventurous, have led to but small practical results beyond the loss of a certain number of lives and the detention of a portion of the enemy's forces.

The fighting round and about the Tonale Pass, the gap between the Ortler and Adamello snows, has been more serious. But here again no attempt to advance in force would appear to have been made by either side. The fighting has been more or less desultory, though it has occupied a large space in bulletins. Knowing the ground I am tempted to describe it in some detail as a specimen of much of this mountain warfare.

The Tonale Pass itself (6180 feet) is a very easy carriage road; the top is a broad and flat meadow, the ascent from the east is gradual, the only zigzags are above Ponte di Legno on the Italian side. It is 2110 feet lower than the Stelvio, and in every respect less formidable. In old days the Austrian frontier was guarded only by a small fort. It is now apparently protected by more formidable works, and no direct attack has hitherto been made on it. The endeavours of the combatants have been concentrated on annoying one another by flank marches over the mountains. First the Austrians, using as a base the Mandron hut beside the Adamello glaciers, crossed one of them, a march of two or three hours over ice, and swooped down on the detachment at the Garibaldi hut in Val d'Avio, a side glen of Val Camonica.

Nothing came of this raid, and in due course the Italians retaliated and apparently for a time seized the Mandron hut and fired down on Bedole, the Alp at the head of Val di Genova. On a subsequent occasion, making a much shorter circuit, they assailed the Tonale road through Val Presena, the glen next to the pass on the Val di Sole side.

All these attacks were on the southern flank of the Tonale. On the northern flank the Italians climbed, and dragged artillery on to the Montozzo ridge, 8500–9000 feet above the sea, which overlooks the Val dei

THE MANDRON GLACIER AND ADAMELLO.

THE FORNO GLACIER.

THE ENTRANCE TO VAL DI GENOVA.

THE GORGE OF THE SARCA.

Monti, a glen running up from Val di Sole to the snows of the Ortler group. So the struggle has gone on, leaving matters much as they were, and with no great advantage to either side.

In the Giudicaria, where in 1866 the Garibaldians had some minor successes, there has been, as far as I know, no fighting of serious importance. The Italians have made some progress above Lago di Ledro towards Riva, but they have not as yet crossed over to Tione and the Val Rendena, or seized the upper exit of the Sarca gorges.

Along the line of the railway up the main Adige valley a certain advance has been secured. The frontier town of Ala has been occupied, and the forts of Rovereto assailed and damaged. The "Altissimo," the northernmost but not the highest top of Monte Baldo, has been gained, and from its brow the Alpini can look down on the head of the Lago di Garda and the towers of Riva. The Italians have not put any war craft on the lake, as was done on Lago Maggiore in 1859, and we may hope that its terraces and lemon gardens will be spared from the horrid devastation that has overtaken so many of the villages and hospices in the higher mountains.

Turning to the frontier of the Trentino east of the Adige we find that Austria has abandoned two of her outlying districts, apparently without fighting, to the Italian advance. The Red, White, and Green tricolor floats on the campanile of Cortina and on the ruins of San Martino di Castrozza above Primiero. The modern hotels there we can well spare, but old travellers will miss with regret the venerable hospice with its wide circular chimney-corner, in the centre of which the logs blazed, while through a narrow window in the external bow a light flashed down the pass to guide the belated wanderer.

The most obvious access to Trent next to that up the Adige Valley is by Val Sugana. This great valley, traversed by the high-road and railway from Trent to Venice by Bassano and Castelfranco, lies between the Monti Lessini, the mountains of Vicenza, and the Dolomites. In its lower portion a long gorge between high walls of rock it expands near its head into a broad vale embosoming two peaceful lakes. This basin is closed by a low ridge from which on the further slope a steep hillside covered with vineyards and villas drops on to the walls of Trent. Here Italy might have been expected to attempt to repeat the events of 1866. In that year General Medici, after driving the Austrians from their strong position at Primolano, hurried his advance, and had reached Levico, 12 miles only from Trent, when his march was stayed by the armistice which preceded peace. But so far no important success has been recorded in this quarter, and Trent remains unthreatened.

From this gap, due east of Trent, up to the bend of the frontier where it turns east near the snowy Marmolada, the Queen of the Dolomites, the country is a tangle of glens and ridges. Between these points there are only two carriage roads that cross the frontier, that by

S. Martino di Castrozza and Paneveggio, and the road from Botzen to Cortina across the monntains by the Karersee and the Falzarego Pass. Desultory fighting, difficult to follow, but in which neither of the combatants—I have had the advantage of reading Tyrolese newspapers as well as the Italian bulletins—claims any decisive successes, has gone on all over this region. The Italians, as their enemies admit, have shown prodigious energy in hoisting guns on to the most difficult heights; on both sides sturdy hill-climbers have vied in stalking one another among the mountain fastnesses—applying to warfare the methods of chamois-hunting.

The fighting has been most serious about the road that runs from Botzen eastwards to Cortina. It crosses by several grass-passes from valley to valley. Bear in mind that we must not carry ideas framed on the physical features and landscapes of Switzerland into the Venetian Alps. In the Central Dolomites there is no high continuous ridge rising above the pasture levels. Such expressions as "great wall" or "sheer rampart," which I have read recently, seem to me out of place when applied to the mountain range south of the Pusterthal. The ascent from Cortina to the crest is less than 1000 feet, the drop to Toblach little more. The Dolomite groups would be correctly figured in the Impressionist maps of which we have so many, not as lines but dots; big dots, no doubt, scattered about in a region of valleys and pastoral heights. The valleys have a way of ending in a low gap instead of a high ridge. Consequently you pass from one to another with relatively little trouble. Here and there frown, like giant castles, the red or grey-gold walls of the great Dolomites, the Pelmo and Antelao, the Civetta and Marmolada, the fantastic Rosengarten, and the incredible Pala. But between them spreads a bevy of green and friendly hills. One of these, the Col di Lana—Col in the Dolomites is from *collis*, and means a hill, not a pass—commanding the Falzarego Pass, has been the scene of furious fighting. The Austrians were at the top, the Italians on its spurs. When I strolled up it years ago in early July, the broad pasture of the Incisa Alp, on which it looks down, was more gloriously arrayed than any Alpine meadow I have ever seen. There were bays of red rhododendrons, pools of the larger gentian (*G. acaulis*), rivers of forget-me-nots, lilies tawny and white, brilliant arnica, fragrant nigritella. It recalled to me the description of the Valley of the Princes on Dante's Mountain of Purgatory. And now this Garden of Proserpine, the haunt of shepherds and peaceful herds, is being defaced by trenches and watered with blood. The pity of it! But the works of nature will recover more readily than the works of man. The ruins of Rheims will remain through the centuries the shame of Germany. Here a few years, and flowers will cover the trenches and the graves and there will be only an echo in the valley homes to tell of "old unhappy far-off things, and battles long ago." Battles I fear with relatively small result. The Italians have gained the disputed crest of the Col di Lana,

THE SCHLERN.

THE PEAKS OF PRIMIERO.

IN THE CARNIC ALPS.

THE AMPEZZO VALLEY AND ANTELAO.

but they are still far from breaking through the hills and bursting out on Brixen or the lower Pusterthal. Could they do so in sufficient force they might cut not only the railway from Lienz and Vienna, but also the Brenner line below Franzensfeste, the great fort that protects the junction of the two railways.

An easier if not more inviting line of attack lies open along the Strada d'Allemagna from Cortina, and from the valleys next it. There is, as I have already said, little or no pass in the more common acceptation of the word between the southern valleys and the Pusterthal. The Tofana and Monte Cristallo stand up like two Egyptian propylons shadowing the crooked trench through which the high-road runs past Peutelstein and the gloomy Dürrensee. From Cortina to the railroad at Toblach is only 18 miles. Here in June the Italians advanced in three columns. Along the high-road, and through Val Travernanzes behind the Tofana, and through Val Grande under the cliffs of Monte Cristallo. In these encounters the Austrians claim that the loss of their opponents was 59 killed and 119 prisoners. Some ground was probably gained, but no really important strategic advantage appears to have been secured. On the east a few miles distant at the Mesurina lake, and on the watershed of the Drave at the Kreuzberg at the head of the Sexten Thal, there are low and practicable gaps furnished with carriage roads. Here the Italians hold the crests; from the Mesurina lake and the Kreuzberg they have made incursions and harassed the enemy, but no more.

We have now reached the eastern limit of the Trentino.

We must, I think, reviewing as a whole the operations on the Trentino frontier during the first six months of the war, come to the conclusion that the Italian offensive has been intentionally limited to a defensive object. This without further explanation may sound paradoxical. General Cadorna has, I believe, striven, and on the whole successfully striven, to secure the positions that were most essential in order to repel possible attacks on Lombardy or Venetia issuing from the Trentine highlands. But, as far as I can judge, he has shrunk hitherto from the cost of life necessary under existing conditions to storm the main Austrian positions that protect Trent and the railways that connect it with the north. Italian impulse is apt in essentials to be tempered by a fund of political discretion. In the national temperament the qualities of a Cavour as well as those of a Garibaldi play their part. But if the daring feats which the Italian troops have accomplished, feats frankly acknowledged by the foe, among the glaciers of the Ortler and the crags of the Dolomites, have not so far led to any great strategic successes they have more than sufficiently proved the enterprise and the gallantry of our allies.

East of the Sextenthal and Auronzo we enter the zone of the Carnic, or Julian, Alps, lying between the Gail valley on the north and the tributaries of the Tagliamento and the Isonzo on the south. The types of

scenery on the two flanks afford a strong contrast. On one side we have green valleys with meadows, pine-forests and trout-streams, broad wooden farmhouses each standing solitary in its fields, Slavonic in their character: on the other deep trenches, their naked sides gashed by torrents and landslips, their flat floors a mass of boulders through which, except in flood-time, a scanty stream wanders vaguely from side to side past dark stonebuilt hamlets. The district is one of the wettest in Europe, and these valleys are appropriately called "Canali." The suggestion that this term came from their connection with Venice will not bear examination; it is also in frequent use in the Tuscan Apennine. It is not till the lower hills on the verge of the flats of Friuli are reached that the landscape shows any touch of Italian luxuriance.

Across this range there have been from Roman (and even earlier) times four separate routes open to tribal migrations, armies, or commerce. Their goal was at one time Aquileia, and at a later period Venice—both marts of Eastern produce and links between the Levant and Central Europe.

The westernmost, the Plöcken Pass (4471 feet), was a Roman road, and large portions of the old paved track still exist. The pass served afterwards, for the commerce of Venice, as a branch of the Brenner. It is very easy and is still traversed by some sort of carriage-road. Like the other passes, it has been the scene of sundry unimportant engagements in the present war. I pass over several little-used gaps in the chain, the names of which may be read on the map in Mr. Buchan's 'History of the War.' I am told on good authority that roads not yet marked on official maps have been built by the Austrians up to their frontier on three of these passes.

With the last three passes on my list, the Pontebba, or Tarvis Pass (2582 feet), the Predil (3829 feet), and the Birnbaumer Wald (2892 feet), we come to the point of greatest weakness in the long Alpine frontier, and consequently of greatest pressure. These passes afford the key to the head of the Adriatic to an invader from the north or east. An Italian army that has mastered them has overcome the chief obstacle on the road to the Danube.

It was from the Birnbaumer Wald that the hordes of the Cimbri threatened Italy. It was in this region that Napoleon in his brilliant campaign of 1797 forced in a few days the passage of the Alps and opened the march that ended by the peace concluded at Leoben. No contrast can be sharper than that between the slow, ineffectual persistency of modern trench-warfare and the brilliant manœuvres by which Massena broke at Tarvis the right flank of the Austrians, and cut off the retreat of half their divided force, while Napoleon drove the rest helter-skelter back over the Isonzo from Gorizia to Laibach. Here by protracted and very severe fighting the Italians have mastered the first line of defence, but are still beating against the second. The Italians have

FOČA.

THE ROMAN BRIDGE, VIŠEGRAD.

THE GORGE OF THE SUJESKA.

THE HIGHLANDS OF HERZEGOVINA.

attacked Pontebba and approached Tarvis. But they have not as yet won the command of the passes. Nearer the coast they hold the line of the Isonzo; but the resistance of the enemy behind it is, if shaken, unbroken. Despite the most gallant efforts, the entrenched camps of the Austrians still close the lower ground between the mountains and the sea, and bar the approach to the Birnbaumer Wald and the road to Trieste. The Austrians profess to be content to hold the invader until such time as they may have their hands free to take their revenge. It is for military critics and politicians to explain the reasons for which the more serious efforts of so large an army as the Italian have been, like our own in Flanders, concentrated on a single and narrow front.

We must all hope that this strategy may be crowned with success, that at no distant date the lines written by a late Roman poet to celebrate a successful campaign on this very ground may be again applicable:

> "Illa sub horrendis prædura cubilia silvis,
> Illi sub nivibus somni, curæque, laborque
> Pervigil, hanc requiem terris, hæc otia rebus
> Insperata dabant; illæ tibi, Roma, salutem
> Alpinæ peperere casæ." *

Before I end my paper I am tempted to add some particulars and show a few views relating to another and less-known section of the frontier of Austria: the frontier she acquired by the annexation of Bosnia and Herzegovina in 1908. In 1907 I travelled along the portion of the frontier that faces the Sanjak of Novi Bazar and Montenegro, following the line of an old and neglected caravan track, now being converted into a military road, by which merchandise from the heart of the Balkan Peninsula could evade the Montenegrin fastnesses and reach Ragusa without making the long circuit by Sarajevo and Mostar. After admiring the beautiful waterfall of Jaice and climbing the heights of the Prenj I visited Sarajevo. From the Bosnian capital I profited by the strategic railroad, of which one branch ends at Višegrad, famous for its Roman bridge, on the Serbian frontier, and the other on the edge of the Sanjak.

The hills that divide the basins of the Bosna and the Drina are very picturesque. For over 90 miles the line alternately pierces, or bridges, previously pathless gorges, or winds with the aid of elaborate earthworks over heights covered with primeval forest, mostly beechwoods and scattered wild fruit-trees. Some idea of the difficulties surmounted by the engineers may be got from the fact that there are ninety-nine tunnels, of a combined length of 9 miles and thirty important iron bridges in addition to the very heavy revetments necessary to hold up the loose slopes traversed. The gauge is 75 centimètres, the same as that of the

* Claudian, 'De bello Getico,' 359–63.

other Bosnian railways. The work was completed in 1906 and had obviously a military object.

From the station of Ustapraca a good road leads past the prosperous country town of Goražde up the idyllic valley of the Drina, a deep smooth-flowing stream whose green waters linger in long still reaches on their way to the distant Save and Danube. The district is famous for its fruit gardens and orchards. Pleasant villages nestle among them, and over the orchards rise the homely wooden minarets of Turkish mosques. The Turkish population here gives no trouble. It has been among the orthodox Serbians that the Austrian Government has found its chief difficulties. Foča the chief town of the district was my first sleeping-place. Its name has been often in the newspapers in the last twelve months. The Montenegrins last year came out of the upper valleys about the Drina sources and occupied it for a short time. It is a charming spot; the town itself is still very Turkish in character, a pile of old wooden houses and carved balconies. Its situation in the centre of hospitable hills, and at the meeting of two rivers laden with timber-rafts, is delightful. Its former importance is attested by a mosque far surpassing in architecture and decoration any at Sarajevo. The minaret is of admirable proportions, the porch of noble size, the stonecarving of the pulpit and gallery is exquisite and the interior is painted with delicate patterns resembling those of the best sixteenth-century Persian tiles and carpets. In the days when the caravans from the centre of the peninsula going to Ragusa came this way Foča must have been a place of much traffic, the last halt before the traverse of the wild gorges and windswept uplands of the Herzegovina.

In 1907 the carriage road ended at a bridge over the Drina a few miles from Foča. At that point the old paved Turkish road leaves the river which flows down out of the heart of Montenegro, and climbing along a wooded hillside, dotted with scattered farms, descends again into the valley of a tributary stream. The scenery now grows more mountainous, and glimpses of fine limestone peaks open to the south, amongst them Maglič (7891 feet), over the top of which runs the Montenegrin frontier. After passing a bridge and a Turkish coffee-house the gorge of Sujeska, the most famous of the many Bosnian gorges, is entered. Limestone defiles are apt to be very similar in their features. The special character of the Sujeska is due partly to the very jagged nature of its rocks, and partly to the picturesque way in whioh they are wooded. Splintered combs bristle on the hillsides; sharp teeth cut against the sky-line. Dark pines with stiff horizontal branches, like those of a Japanese print, perch upon every ledge, and there is no lack of deciduous foliage to supply autumn tints and lend beauty and variety to the landscape.

In a most romantic site in the very heart of the defile, a day's ride from Foča, stands the blockhouse of Suja, in which a room is reserved for the few, mostly official, travellers. A letter kindly given me by

the Governor of Bosnia ensured me admission. Seen by moonlight the surrounding landscape may perhaps best be described as operatic. But there are no players in the foreground. The only inhabitants of the mountains, besides a few outlaws, are chamois, deer, bears, wolves, and eagles.

Beyond Suja the mountains close still more nearly on the river. At the upper end of the gorge the cliffs touch the stream, and the track is carried for a few yards on a wooden balcony above the water. Here in old days was a castle, a gate, and a toll. The name of the spot, of these impending rocks, Tavernich, sounds familiar. The lines of Dante in which he emphasizes the thickness of the ice in Hell by telling us that if Pietra Pana or Tavernich were to fall on it it would not crack—"non avrea fatto crich"—leap into the mind. Pietra Pana is the Pania della Croce of the Carrara Apennine. Have we found the Tavernich which supplied the poet with a rhyme and has worried most of his commentators? Dante may as well have heard from Italian merchants of this remarkable place as of the dykes of Flanders. The suggestion may seem fantastic to some; it did not seem so to the late A. J. Butler, or the Marquis of San Giuliano, both competent Dante scholars.

After this exciting gorge one comes to tamer scenes; an upland vale pastured by much cattle and countless sheep whence the track climbs to the watershed, if a ridge that sheds water only on one side can be called a watershed, at the Cemerno Pass, 4528 feet. It is a broad grassy brow crowned by a large Austrian fort, where the garrison spend long snowed-up winters and shadeless summers. Henceforth there is a fort every few miles all the way to Trebinje. Looking back one sees the limestone peaks of the Maglič and its neighbours. In front stretch the waterless uplands of the Herzegovina, a region where rocky reefs rise in interminable succession, and there is more stone than grass. At Gacko, the first Herzegovinian hamlet, the carriage road begins. Its white houses lie in one of the broad level basins girt by hills characteristic of Karst scenery.

Across these hills for a long day's drive the road winds over a desolate district, with the tame ridge (4000 to 5000 feet) that marks the edge of Montenegro always within a mile or two on the left. It is a strange monotonous country with an air of the Syrian Desert, and like the Desert capable of gemlike moments when its grey dress is exchanged for a coat of iridescent atmospheric colours. At last the road descends steeply between heights crowned by high-perched fortresses, and Trebinje comes into sight below. It is a small walled town lying on either side of a sheet of deep green waters, half river and half lake, set in the centre of a little plain of rich vineyards and orchards, and hemmed in on all sides by steep barren hills of strange shapes and violent colours. The landscape is weird; it falls into no category. It is neither European nor Asiatic, though in the sharp contrast between barrenness and the fertility caused by irrigation it inclines to the East.

Far more beautiful, if less original, is the final long descent from the top of the last ridge to Ragusa. The road drops to the Adriatic down hillsides which yield in nothing to those of Mentone or Sorrento, through a revel of summer and sunshine and perpetual greenery, of figs and vines, olives and mulberries. At the foot Ragusa basks in the sunshine and dips her feet in the waves, an unspoilt mediæval seaport, still enclosed in a girdle of lofty brown walls and moats, the latter gay with oleanders and orange trees. *Unspoilt* the city remains because by a happy chance the harbour is too shallow for modern ships and its port and railway lie two miles off at Gravosa, on the other side of a low peninsula.

From Trebinje the frontier runs south over a highland district inhabited by fighting clans so as to give Austria control of the Bocche di Cattaro. On the north shore of this lovely fiord—a Lago Maggiore by the Sea—Austria possesses a picturesque town, the terminus of a railroad, Castelnuovo. At the head of the fiord lies Cattaro. Mt. Lovchen, from which it has been bombarded for many months, is, one of our newspapers informs the public, "the only prominent mountain in Montenegro." I am afraid that is a sample of the sort of information, with maps to match, which too often lies on our breakfast-tables. I have a list gleaned in the last few months from our daily press of similarly wild assertions and confusions with regard to the Italian frontier. Most of them might have been avoided by the use of a Baedeker. But probably editors are too patriotic to use Baedeker any longer. With a view of Cattaro, the quaint little port wedged in between the sea and the mountains, I close my travels and my discourse.

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Postscript.

A recent paper, "**Oesterreichisch-Italienische Grenzfragen von Dr. R. von Pfaundler, Wien**" (*Petermanns Mitteilungen*, June, 1915), is a painstaking and able plea in favour of the frontier offered by Austria. Its argument rests mainly on linguistic and racial considerations with some reference to existing administrative boundaries. The writer apparently inclines to give the Ampezzo district to Italy. In this case he works out from the census of 1910 the figures as follows:—

Territory ceded by Austria:	Italians and Ladinians,	366,837
	Germans,	13,892
Territory retained by Austria:	Germans,	511,222
	Italians and Ladinians,	18,863

He proceeds to give figures for the frontier officially claimed by Italy.

Territory claimed from Austria:	Italians and Ladinians,	371,477
	Germans,	74,000
Territory retained by Austria:	Germans,	440,805
	Italians and Ladinians,	14,229
The population of the Ampezzo district is stated to be	Italians and Ladinians,	5,990
	Germans,	443

From a practical and judicial point of view the weakness of the case presented is that it ignores the strategic objections that may be raised by Italy while insisting on those alleged by Austria. Botzen and its surroundings, with the control of the mouths of the great valleys and the access to Trent, are the substantial bone of contention.

The accompanying map, in laying down the frontiers offered by Austria, is not in accordance with the statements of Baron Burian recorded in the despatches of the Italian ambassador at Vienna of April 16 and 25, 1915. In these the line indicated keeps for Austria more of the Nonsberg and the districts both of Fassa and Ampezzo.

Sir Maurice De Bunsen: I have really no title to address you this evening, but owing to the fact that for a few months—less than a year—I had the honour of representing this country at Vienna, I naturally take a deep interest in all the matters that have been so clearly explained to us and illustrated this evening. I was not there long enough really to travel much, but I did take one journey which brought me into a part of the region which we have heard about to-night, and I feel very grateful to our President for the clear way in which he has described to us that important frontier, which I confess till now has been full of mystery to me. I think I shall henceforth be able to follow more intelligently the accounts which we receive every day of the progress of the Italian arms in that region. The only journey I took was from Vienna through Graz (that entirely German town), through Laibach, entirely Slovene, where if you ask your way in German you won't be understood, onwards towards Trieste, passing the wonderful Adelsberg caves in the Karst that our President referred to—a ridge

between Trieste and the Italian frontier. They are wonderful caves, and I think the most extensive and marvellous I ever saw. From there I went on to Trieste, where my wife and I were the guests of our Admiral Sir Berkeley Milne who had brought the British Mediterranean Fleet to pay a friendly visit to Trieste and to the Austrian people, two or three months only before this devastating war broke out. I stayed with him on board his battle cruiser, the *Inflexible*, for several days. We were most hospitably received by the Austrian Admirals at Trieste. We exchanged toasts with them daily, and nothing was further from our minds than the idea that war between Austria and England could ever be possible. I cannot help looking back to that time and regretting the fact that we are compelled, by the bad choice that Austria has made of her friends, to be at war with Austria. They are a pleasant kindly people, and I do not give up the hope of being friendly with them again in future. The Austrian Admirals had nothing but friendly feelings towards our country. I could see that they had very bitter feelings towards Italy, and contemplated a war with Italy as a possibility of the future. From there we went to Venice and from Venice by motor in one day to Trent, and spent only one night and half the following day at Trent, but enough to see what has been described to us this evening,—how entirely Italian it is in character and the speech of its inhabitants. We felt ourselves almost back in Italy in this town of Trent. Then we went on to Botzen, where you get an entirely German-speaking country, and we should have explored it a little longer, but I think at this moment Essad Pasha committed some escapade in Albania which created a situation, compelling us to rush back to Vienna. So I have only a slight bowing acquaintance with this region, which after this evening I think we shall understand in greater detail, and for my part I am extremely grateful to the President for his address, which I think has been most illuminating and most valuable. I desire to tender him my thanks and to hope that some day we may all have an opportunity of visiting again those regions which he has described.

Lord Bryce : There are two difficulties I feel in rising to say a few words in compliance with the President's request. The first is, I have been over nearly the whole of the ground he has described and have so many interesting memories of it, that if I were once to begin to indulge in reminiscences I should detain you all night; and the second difficulty is a greater one, that I am in the position of agreeing with everything the President has said. I do not think I have ever listened to a more interesting lecture, or one which was more judiciously directed to matters of present importance than that which he has given us. I can only wish that he had had an audience of all the historians and all the soldiers—generals, colonels, and General Staff, in this country, as well as the geographers, because there is no part of Europe more significant now than this Alpine line where Italians and Germans and Slavs of all kinds have come into contact, and none which is more interesting to the soldier in respect of the opportunities of studying the peculiarities of mountain warfare which have arisen along this line. What the President has said about the difficulty of drawing an ethnological frontier of demarcation between the Italian and German population along the whole country from the eastern border of Switzerland as far as the place where the Slavonic population begins to come in to the north and west of Trieste, seemed to me, as far as I can judge from the observations I made in travelling about the country, to be exactly correct. It is true, as he has said, that although there is in Botzen an Italian-speaking element of perhaps one-third of the whole, still upon ethnological grounds that town and its neighbourhood ought to be assigned rather to the Teutonic than to the Italian race. The other valleys to the south-west and west of Botzen, such as the Val di Sole and Val di Non, are entirely Italian, though a few Germans are scattered here and there. There are

two very interesting valleys lying between the Italian and German speaking parts. These are the two valleys of the Grödner Thal and the Gader Thal, whose inhabitants speak neither Italian nor German, but a very ancient form of Romansch, which the people themselves call Ladin. Were they not so small they would do very well to constitute a sort of "buffer state" between the German and the Italian populations. The Ampezzo Valley is one of the districts where it is hard to draw a satisfactory line. When I first visited Cortina in 1863 it was a little place of not more than something like fifteen to twenty houses, and tourists were so strange that when five of us descended into it the whole population gathered round us, watched us eating our breakfast and stayed observing us until we departed. Now it is a town full of large hotels. Here the population is slightly mixed, and perhaps rather more Italian than German speaking, while Cadore, some 10 miles to the south, is pure Italian. It may seem surprising that the Italian troops should not have done more to try to get at the Trentino from the east through Val Sugana, because it is the most open of the valleys that give access to Trent, an easier way than over the Tonale, on the further side of the Adige Valley; but modern warfare offers enormous difficulties in mountainous countries to an attacking force. Where you come amongst rocks and cliffs and thick scrub and loose stones (as, unfortunately, we are finding in the Dardanelles) it is possible to plant batteries and hide machine guns in such wise as to expose the attacking party to a perfectly murderous fire. In confirmation of what the President and Sir Maurice de Bunsen have said about Austria and Italy I may remark that so long ago as 1889, when I was wandering along the line of passes north of Venice, we came upon a spot at the top of one of these passes—I think it was the Predil—where according to tradition Alboin, King of the Lombards, pointed out to his fierce invading host the fertile plains of Italy below. There we found on the Italian side strong fortifications, and going a little further north to the Austrian side more strong fortifications. Although both countries were members of the then recently formed Triple Alliance they entertained so much suspicion of one another that they had been erecting these fortifications each against the other. The President has given you a very graphic and charming account of the scenery about Ragusa, which is certainly one of the most picturesque of towns; and any one who wishes to make a delightful excursion in beautiful scenery combined with extremely interesting architecture and the most charmingly varied costumes worn in any part of Europe, cannot do better (when peace has been restored) than take a steamer from Trieste along the coast as far as Cattaro or Antivari.

As respects Mount Lovchen, it is a singularly noble peak with a marvellous view. It stands isolated, and on the top of it there is a tomb where one of the last of the Vladikas, or priest monarchs of Montenegro, is interred; so it has become a sort of sacred spot with the whole Montenegrin people. As its slopes command the inlet of Cattaro, one wonders that it was not found possible to carry up some guns there, and with those guns bombard Cattaro, Castelnuovo, and the other forts so as to drive the Austrians out of the harbour, which for naval occupation she finds very convenient. The subject of mountain warfare is an exceedingly interesting branch of military history upon which we may hope after the end of the war to learn much that is new. No campaigns, except that of Napoleon in 1797 and that of Suvarof against the French in the Swiss Alps in 1799, has thrown so much light on it as may be expected from these conflicts of Italian and Austrian troops along the line described by the President. These conflicts over glaciers and among those tremendous pinnacles of which such superb views have been shown this evening will have a new and special interest to us since we have heard the geography and orography of the region explained to us with so much lucidity and such complete mastery of the subject as the President has given us to-night.

THE FLEET MEMORIAL TO CAPTAIN SCOTT.

His fellow-officers in the Royal Navy have been fortunate in obtaining an admirable position for their memorial to Captain Scott, and still more fortunate in that the statue which they have erected in Waterloo Place is the work of Lady Scott. The photograph which we publish (*see Frontispiece*) cannot do justice to this fine work; but it does show the striking use which the sculptor has made of the characteristic Antarctic dress.

The monument was unveiled on the afternoon of Friday, November 5, by Mr. Arthur Balfour, First Lord of the Admiralty, in the presence of a gathering of officers of the Fleet and of representatives of the scientific societies invited to attend by Admiral Sir George Egerton, Chairman of the Committee.

In the course of a brief address Mr. Balfour said—

> "What the Fleet has done for the safety of these shores, for the greatness of this Empire, and for freedom throughout the world, is a commonplace among the English-speaking peoples. We sometimes are apt to forget how much it has done in the unwarlike and yet most dangerous work of exploration, travel, and of wresting from nature secrets most jealously held. Between the place where I am now speaking and the Admiralty only a few yards off, there are already two statues erected by a grateful country to great explorers. The statue opposite where we are standing is that of Franklin; the statue nearer the Admiralty is that of Captain Cook. We are adding to those two another statue of one full worthy to be ranked with his compeers.
>
> "We, who look upon it, and those who come after us when we have departed, will be able to look upon this memorial of Captain Scott and say, 'Thus he appeared to those who knew him in life. So he was portrayed by one who was united with him living and has fashioned an immortal testimony of her affection after his death.' This is a rare work of art; it has been made in memory of a man of rare courage and rare genius."

THE GREAT ICE BARRIER AND THE INLAND ICE.

By the late Captain R. F. SCOTT, R.N.

We are indebted to Lady Scott for the manuscript of this lecture, which was delivered by the late Captain Scott at Cape Evans on 7 June 1911. The lecture is an expression of the author's personal views regarding the Antarctic ice, and an example of his keen interest in the scientific aspects of his work. The arguments for the flotation of the northern part of the Ross Barrier, and for its growth from direct snowfall, are now widely accepted; and on other points the later work of this and other expeditions has thrown additional light. The paper must therefore be read not in the somewhat fuller light of present knowledge, but as a statement and discussion of the problems as they presented themselves to the leader of the expedition not long

after he had established his base, and while he was training his staff for the enterprise ahead.

In the successful investigation of these phenomena lies the whole problem of the nature and extent of the Antarctic glaciation; no more important problem can engage the attention of an Antarctic expedition. The object of this paper is to affirm that importance, and to re-examine the facts which we possess in connection with the phenomena.

On returning from the *Discovery* expedition in 1904 I gave reasons for my opinion that the greater part of that extraordinary ice mass which we know as the Great Barrier is afloat. These reasons are contained on pages 417–420 of the narrative of the voyage. I will here repeat them with greater elaboration.

For 360 miles to the eastward of a line joining Cape Crozier to the bluff, the depth of the sea at the Barrier edge exceeds 300 fathoms (1800 feet), whilst the height of the ice-cliff is not more than 150 feet, except in one place (I have reason to doubt this single exception noted, viz. 240 feet. The *Terra Nova*, with help of the range-finder, will have settled the point). The factor of flotation of this barrier ice, that is, the proportion of the submerged to the above-water volume, is not yet determined, and is an element of the problem which earnestly calls for study.

It will be seen, however, that even if this factor be taken as 7 to 1, the extreme for solid ice in fresh water, there must still be some hundreds of feet between the bottom of the Barrier and the sea floor.

But it is obvious that the above-water section of the Barrier contains a great deal of included air and the under-water section a considerable quantity; moreover, the mass of the barrier is immersed in salt and not in fresh water. These considerations lead us to believe that the factor of flotation lies somewhere about 4 to 1, and this assumption is supported by observations of overturned bergs. If the factor of flotation be taken as 4 to 1, there must be a layer of water underneath the Barrier edge which is nowhere less than 200 fathoms in depth—five times the greatest depth found in the North Sea.

In 1840 the edge of the Barrier was mapped by Sir James Ross, and as he had two ships and his observations depended on latitude sights, there can be no doubt as to the accuracy of the survey. The edge was again carefully mapped in 1902 by the *Discovery*, and Pennell reports the outline as similar in 1911. I shall refer to this last point again. For the present it is sufficient to note that the survey of 1902 shows a very marked recession of the ice edge since it was seen from the *Erebus* and *Terror*. The average recession is from 15 to 20 miles, whilst the maximum is no less than 45 miles, getting on for a degree of latitude.

These facts can mean nothing but the removal of an immense area of Barrier ice which in Sir James Ross's time was *afloat*. There is little or no sign of shoaling north and south in the Ross Sea, though there are

signs of an irregular bottom. If 45 miles of ice have been proved to have been fast whilst floating, the possibility of the ice being water-borne for an indefinite distance to the south is shown. There are further facts to substantiate the water-borne condition of the present ice edge. The *Discovery* remained in Balloon Bight for more than 24 hours, during which period small bergs and floes were carried to and fro with the tide, but the ship remained steady as regards level with the face of the ice wall to which she was moored, showing that the wall rose and fell with the tide.

In endeavouring to find proofs for the flotation of the Barrier in more southerly regions one is met with extraordinary difficulties, but some deductions may be made from observed facts which lead at least to interesting speculations.

An examination of the observed heights of the Barrier edge shows a great variation, from 15 feet to 150 feet or more. The average height is about 80 feet. Allowing the 4 to 1 factor, the thickness of the ice sheet would work out from 70 to 700 feet with an average of 400 feet. I think this is a much thinner sheet than people imagine who have not taken the trouble to study these figures. If the flotation theory holds, in walking south over the Barrier surface a man would never be far above the water-level, whilst he might sometimes have only a comparatively thin sheet of ice under him.

But it is impossible to get through this sheet even at the thinnest parts if we knew where they were. We are forced to seek for other evidences. Some of the most important of these are contained in the natural breaks or crevasses which are formed by the ice-sheet pushing over, or past, land-masses. On a journey south, well inside the course taken by us in the autumn, plenty of these crevasses are met with. The noticeable features about them are these :—

(1) They are in the main radial from the south end of White Island and the Bluff, and except when very close to the land the line of every crevasse appears to be quite straight.

(2) Most of these crevasses have parallel sides whether in plan or section.

(3) All crevasses have vanished at a distance of about 15 to 20 miles from the land, as we have seen by our autumn journey.

(4) No crevasse of any great depth has been observed in the Barrier.

I advance this last statement with caution, because even on the Barrier there have been hazy reports of unfathomable depths. Now I have looked down many Barrier crevasses, and in every case when my eyes have grown accustomed to the dim light, I have been able to distinguish platforms formed by fragments of ice or by fallen snow at distances varying from 10 to 50 feet below. It must be remembered that these are horrid-looking places to the eye, and involve considerable risk to the traveller, so that he has not much inclination even if he had the

time to investigate them very closely. On two or three of the *Discovery* journeys sounding lines were taken with the express purpose of finding the depth of crevasses, and it was very rarely that the lead could be got down to a depth of 8 fathoms.

Having noted such observations as the above, it is well to consider the difference of crevasse phenomena which would result from an ice-sheet resting on land and pushed forward over it, and an ice-sheet afloat and pushing past the land with such very considerable movement as I shall presently show the Barrier to possess.

In the first case it is impossible to imagine uniformity of friction, and therefore impossible to imagine any large area uncracked. Crevasses formed over an uneven surface could scarcely run in straight lines, whereas in section they would tend to be V-shaped on the summit of ridges and the reverse in hollows. Moreover layer would move over layer, distorting crevasses. Only in a floating sheet would one expect to find crevasses of the uniform nature and limited extent found in the Great Ice Barrier. Again, any rupture in a floating ice mass would be healed over at and below the water-level as fast as it was made. An open crevasse could therefore only extend to the depth of the sea surface, and this depth would tend to be rapidly reduced by snow and ice falling from the sides and top. This fact would completely account for the limited depth of the crevasses found in the Barrier.

Another observation of interest in connection with the Barrier is the occurrence, at the two places at which we attempted to reach the land respectively south of the Barne Inlet and north of the Shackleton Inlet, of a broad trench filled with a chaos of ice blocks and thaw pools. We descended into the trenches, but nowhere reached a greater depth than about 100 feet below the level of the Barrier surface.

This figure has only an indirect bearing on the flotation of the Barrier, but it must have some relation to its thickness, which is an equally important factor. What this relation is we cannot tell precisely, but if the Barrier were of any extreme thickness, say 1000 feet, one would expect to find pits of at least several hundred feet where it was ruptured in extension.

I have left until now the consideration of a fact which would constitute a very certain proof of the flotation of the Barrier if it were entirely established. Certain temperatures taken by Royds in crevasses seemed to indicate a constant temperature when close to the island, and a rise after a certain depth at a distance therefrom. The method employed in obtaining this result was not above criticism, and therefore the facts are not firmly established. If any considerable rise of temperature in the depths of a crevasse can be proved the proximity of the sea is clearly indicated. This seems to me one of the most hopeful directions for further experiment. The nature of the thermometer to be used requires consideration. One would seem to need either a

thermometer with maximum and minimum indicators or a sluggish thermometer like those employed for earth temperatures.

In 'The Voyage of the *Discovery*,' vol. 2, page 418, I drew attention to the atmospheric pressures which we recorded on the Barrier and compared them with the synchronous observations at our base. I said, "It must be remembered, of course, that this comparison of pressures cannot be an exact method of determining levels in such circumstances. A small difference in pressure may be due to the normal barometric gradient or to local disturbance, as well as to a small difference of level; yet I do not think that any one studying these figures can come to any conclusion but that we travelled over a level plain, except perhaps for a slight rise where the last two readings were taken, and this is easily explained by our exceptional nearness to the coast-line at the time." Now these pressures are such as might have been obtained if one travelled over a level plain with a small barometric gradient; the only alternative is that a rise of pressure due to the barometric gradient was almost exactly compensated by a fall due to increase of altitude, a coincidence which would be truly remarkable. It is also a question whether the absence of wind on the Barrier does not argue a small barometric gradient.

Attention may here be drawn to page 492, vol. 1, 'Meteorological results of the N.A.E.,' in which a rise of the Barrier surface of no less than 2 feet per mile is assumed. The assumption seems to be wholly unwarranted by fact. It is a pity that such misleading theories should find a place in a serious scientific work.

In summing up our evidences concerning the condition of the Barrier over the greater part of its extent it appears that whilst no single fact affords conclusive proof of the flotation theory, the tendency of all observed facts is in support of that theory and the concensus of these facts affords an indication which is within measurable distance of proof. One circumstance is certainly proved. There is no inclination of the Barrier sufficient to account for its motion.

The eastern limit of the Great Barrier must be in the neighbourhood of King Edward's Land; it seems reasonable to place it in about the longitude of the Balloon Inlet (now the Bay of Whales), as the ice cliff to the eastward has not receded since 1840. The northern and western limits are accurately fixed. The extent to the south-east is the unknown factor. The greatest dimension appears to be in a north-north-west and south-south-easterly direction, and this is consequently the most important direction for exploration, having regard to the Barrier problem.

The measurement of the movement of the Barrier was almost accidental. A depôt mark made in 1902 was revisited 13½ months later and was found to have moved 608 yards from the original alignment on two peaks on the Bluff. Accidentally also this depôt was rediscovered by

the *Nimrod* expedition in 1908, and the first measurement was confirmed by observations covering a greater interval of time (the average annual movement was 500 yards). Two facts concerning these measurements must be remembered—

(1) That being in one direction only they do not necessarily represent the total movement.

(2) That the movement at this point may not represent the movement elsewhere.

The measurements show a minimum movement at the point, and possibly only a fraction of the movement at a more easterly point. As a probable minimum of the average movement it is a startling fact, having regard to the sluggish glacial movement on the mainland. On my return to England in 1904 I acknowledged our inability to account for the fact supposing the glaciers to be the main feeders of the Barrier mass.

I owe to Dr. Simpson the suggestion of a theory that should have been considered before, which must certainly largely influence and probably nearly wholly accounts for the movement of the Barrier. This suggestion is that the Barrier is mainly fed by the deposition of snow on its surface, and that the movement results from the expansion of this mass, which would naturally result from its weight.

It is well to realize with figures what we are asked to consider in this theory. The shortest diameter of the Barrier area is 350 miles; if we take the average thickness as 400 feet, or one-fifteenth of a mile, we get a proportion of 1/5250 between thickness and length. This proportion would be represented by a sheet of cardboard one-eighth of an inch in thickness and 55 feet in length, or 5 feet longer than the hut. This gives us a clear idea of Barrier dimensions.

So far as we know the Barrier can only move in one direction, viz. towards its northern face. This face is 350 miles in length; let us assume that there is an annual average movement of this face amounting to half a mile (a fair assumption having regard to the measurements mentioned), (Prof. David assumes one-third of a mile). It follows that 175 square miles is the area of the yearly addition to the northern face and that the mass of that addition

$$= 175 \times \frac{400}{2000 \times 3} \text{ cubic miles} = 11{\cdot}7 \text{ cubic miles.}$$

PENCIL NOTE IN MARGIN OF MS.

Here well to consider points eventually resulting from Nelson's remarks in debate.

This in simple form refers to disinclination of layers of sea water to mix; such layers are in equilibrium, salinity balancing temperature. This very well studied from Helland Hansen's work in the *Michael Sars*. The application shows that caution must be exercised in supposing any melting on the under surface of the Barrier—it also affords the suggestion that melting if taking place will be more rapid near the edge of the sheet.

Leaving this figure for the moment we will consider the annual deposit of snow on the Barrier surface. By deposit I mean net deposit, snowfall less evaporation. I estimated a deposit of 4 inches of compressed snow during the *Discovery* expedition, but this was based on snow between successive crusts which I am not now inclined to believe to be seasonal.

A better though still imperfect estimation is that resulting from the finding of the old *Discovery* depôt. This observation yielded an average annual deposit of 13 inches of compressed snow, equal to $7\frac{1}{2}$ inches of water. Again using the flotation factor of 4 to 1, this is nearly equivalent to 9 inches of ice ($\frac{3}{4}$ ft.) of the mean density of the Barrier ice.

Now having regard to the shape of the Barrier area, and since its least diameter is 350 miles, its minimum area must he 350×350 square miles. It follows that the annual increment to the whole area of the Barrier by reason of snowfall is $35 \times 35 \times \frac{3}{4} \times \frac{1}{60}$ cubic miles = 15·3 miles. This argument, which has appealed to the scientific staff of all Antarctic expeditions as very forcible, would be better displayed by reducing comparison to terms of snowfall.

We have now arrived at two interesting figures, viz. 15·3 cubic miles as the annual increment of the Barrier, 11·7 cubic miles as the annual movement of the Barrier ice past a fixed line on the northern face. The difference may be due to an underestimate of the rate of motion of the Barrier or to the ablation of the under surface by the sea. But the fact established beyond dispute is that the snowfall on the Barrier is sufficient to account for the Barrier movement: a fact of the first importance.

I suggest as a further indication that ice-sheets expand under their own weight when afloat, the slight curve often observed at the edge of the Barrier, and numerous shallow-domed bergs. The important bergs are the tabular ones; these must be the majority to start with. What modifies their form? Does the under surface melt faster at the edge than in the middle? This also would account for dome shape.

These figures do not suggest that the Victoria Land glaciers do not add to the Barrier mass or increase its movement; it is more than likely that they do so to a small extent which can only be ascertained when their own movement is known. So far as our observations go, the movement of the glaciers of the mainland is exceedingly slow, and there is at least an indication that the movement is greater in the north than the south. Without such a theory as that stated above it would be impossible to reconcile this fact with the supposition that the mainland glaciers were the *sole* cause of the movement of the Barrier. It is to be noted that these glaciers occur at infrequent intervals, about one to 100 miles, and that they vary from 10 to 15 miles in width. To suppose them responsible for the Barrier movement is to suppose that they themselves move with at least six or seven times the rapidity of the Barrier.

It has been suggested that the disturbances occurring at the mouth of the Barne Inlet and Beardmore Glacier are evidence of rapid movement. To that suggestion I demur. Such disturbances might easily occur in a slow-moving glacier meeting with solid obstruction. A clearer indication of the movement of these great glaciers is supplied by the trenches to which I have referred, but I am unable to suggest any definite facts to be derived from this phenomenon. (*Pencil note in margin.* Here further description of these trenches and important observation concerning their local nature.) *Primâ facie* these seem to me much more indicative of an independent barrier mass which is being slowly thrust from the coast by the glaciers than one which results from the outpouring of those glaciers.

Before leaving the subject of the Barrier there is one other observation of great interest to which I should like to draw attention. Campbell, in a letter of February 5, 1911, states that at the end of January the *Terra Nova* carried out a running survey of the Barrier to the Big Bay in longitude 170° W., and adds, "there appears to be hardly any change since 1902." Having regard to the changes in Balloon Bight, this stability of the western edge is surprising. One would have expected a considerable recession during nine years in view of that which occurred during the previous sixty years.

The indication is that the breaking up of the Barrier is an irregular process, and that there are "catastrophe" years in which large masses of ice are removed. There is a certain amount of support for this view in the records of ice met in the southern oceans; it is on record that in certain years icebergs have been abnormally plentiful. We have also an indication of support in the breaking up of the glacier tongue.

Passing from the Great Barrier and its problems I would now revert to the mainland glaciers. Strange as it may seem we have no evidence whatever to support a rapid movement of these glaciers, whilst we have quite a mass of facts which point to a sluggish condition of ice in many places on the mainland. The supposition of a rapidly moving glacier is purely an effort of imagination and is without doubt invoked to account for the Barrier movement.

In one case Prof. David suggests considerable movement on account of the pressed-up condition of the sea-ice (Nansen Glacier); but we know that the sea-ice itself is constantly in motion and must press heavily against any exposed point. Bernacchi described the high ridges formed on the outer edge of the beach at Cape Adare, a comparatively sheltered spot. Recently we have seen extraordinarily big pressure effects even on Little Razorback Island, apparently a wholly sheltered spot. I cannot admit the pressure of sea-ice as a proof of glacial movement, especially on the coast of Victoria Land.

Physically the movement of glaciers depends on their inclination, on the temperature of the ice, and on the pressure behind. The inclination

of all the great glaciers of the mainland is small. How reluctant ice is to move on a steep inclination in this climate can be seen in the Ferrar Glacier and in the numerous hanging glaciers. The temperature of all our glaciers must be about equal. It follows that movement must be mainly a measure of the pressure behind, that is of the Great Inland Ice-sheet or other sources of supply.

Now I came back from our Western journey in 1903, firmly convinced that there was practically no increase in the surface of the inland ice proper, although there might be an addition to the coastal region. Professor David says, "Portions of the high plateau at a greater distance inland from the shore than 50 miles at present probably receive only a very small snow supply. It may be doubted whether the surface of this *névé* field far inland is not on the whole being reduced in level."

Apart from these expressions of opinion, it must be clearly evident that if the Antarctic glaciation is receding the internal ice-sheet must be suffering denudation. The very great recession indicated in the glacier valleys must be some measure of the diminution of the ice-sheet from its maximum. (*Marginal Note*:—Dimensions of recession 200 feet below, less above, but probably at least 200 feet or more on plateau.) This shows only that above the pressure of the ice-sheet must have been very greatly reduced; and although this much diminished ice-sheet may still be pressing down some of the glacier valleys, I submit that it is more in consonance with known facts to suppose that the pressure is nowhere great, and that the glacier movement everywhere on the coast is mainly due to local *névé* fields and is therefore never rapid. (*Marginal Note*:—Here Taylor on Beardmore Glacier.) All this goes to show the great importance of a measurement of the motion of the Beardmore Glacier. If the change of position of a mark on the glacier can be observed after an interval of two or even one month it should finally settle the question of the supply of the mainland glaciers.

Our knowledge of the inland ice-sheet is, perhaps naturally, even more limited than our knowledge of the Great Barrier. The elements of the problem are very similar; we wish to know the extent, the thickness, and the movement, but also in this case one quantity in addition, the height of its surface at various places. Our information is so meagre concerning these matters that it is perhaps best to consider it with reference to an imaginary rather than a practical conception: to erect an edifice with theoretical bricks which shall serve as a target for criticism, rather than to attempt to build with the too scanty material of fact. I will therefore boldly state my conception of the inland ice-sheet.

I imagine its extent is comprised within about two-thirds of a circle having a radius of about 1200 miles from the Pole as a centre, and the coast line of Victoria Land continued with a slight curve to Graham Land. I imagine a gradual descent of the surface from about 9000 feet in the

locality of the Pole to about 2000 or 3000 feet near the circumferential line, and a more rapid fall to sea-level on the region of this line. I imagine an average motion of from 50 to 100 yards per annum across the line. Finally I suppose that the average thickness of the ice-sheet does not exceed 700 or 800 feet.

My reasons for the various efforts of imagination are as follows:—

The circumferential line to which I have alluded has been touched in the following places:—Adélie Land, Clarie Land, Kemp Land, Sabrina Land, Knox Land, Kaiser Wilhelm II. Land, Enderby Land and Coats Land. There is nothing more striking in the accounts of discovery of these various "lands" than their similarity in describing long ice cliffs from 100 to 200 feet in height with a rising surface behind. In the most circumstantial account, that of the German Expedition, we find that the ice-cliff is interrupted by an isolated volcanic peak.

In Adélie Land something in the nature of a terminal moraine is observed beneath the ice-cliff. In both these cases and in Coats Land we find that the ice-cliff lies within a short distance of the edge of the continental shelf. In all three cases, the only ones in which soundings have been taken, the depths along the ice-cliffs have varied within the same limits.

The idea that the ice-sheet is continuous and uniform behind these various lands is suggested by the apparently continuous nature of the high plateau behind the mountains of Victoria Land. I may mention that before the despatch of the *Discovery* many people held that Victoria Land was a group of islands.

This plateau has now been visited in three places.

In latitude 88 it is found to be about 9000 feet high
" 78 " " 8000 "
" 73 " " 7000 "

whereas in latitude 68 or 69 it falls to sea-level.

These figures are suggestive of the elevational section which I have imagined, a very gradual descent leading to a steeper gradient. It is supported also by the visible rise of surface behind the limiting ice-cliffs.

The shape of the ice-sheet area and its broad front of discharge, the motion of the Barrier and its cause, and such facts as we have concerning snowfall, are the considerations which have led me to imagine the rate of motion as 50 to 100 yards per annum. (*Marginal Note*:—Drygalski figures should have settled this point.) Whilst holding there is little or no annual snow deposit on the higher plateau, it must be remembered that snowfall increases with descent in level and still more rapidly with decreasing latitude. It is probably a very considerable factor for some hundreds of miles beyond the limiting ice-cliffs. In this connection I would add that such a motion as that suggested would seem to me sufficient to account for such facts as we possess concerning the number and condition of the Antarctic icebergs.

I have had the temerity to suggest 700 or 800 feet as the average thickness of the ice-sheet, because this appears to be the average thickness of its edge, and because this edge does not appear to be thicker in higher latitudes. Compare Coats Land, latitude 73°; Clarie Land, latitude 66°. I cannot see any reason why the ice-sheet should grow thicker as one approaches the centre of the continent, though I am not prepared to assert that it does not.

The surmise that the ice-sheet is uniform leads to an interesting conjecture as to the physiographical condition of the land beneath it. This is a question for our physiographer, and I would ask him whether it is not easy to conceive the high continental plateau which such a circumstance would require having regard to the conservative effect of an ice-sheet. (*Marginal Note:*—Conservative effect admitted.) Would a plateau raised with an ice-sheet upon it tend to alter its form? (*Marginal Note:* No.) Cannot it be imagined that in the period immediately pre-glacial the land surface was reduced to what I think the physiographer calls the senile stage of a geographical cycle? (*Marginal Note:* Yes.) Does not the undisturbed stratification of the higher rocks point to a gradual and uniform uplift? (*Marginal Note:* Yes; Taylor thinks these facts strongly indicative of a high land plateau.) What inferences may be drawn from the gradual slopes of the western faces of our mountains in comparison with the steep eastern gradients? I believe we should all be grateful to Taylor if he would descant on these and kindred questions.

I have been talking a great deal on subjects of which I know very little; my only excuse is that others cannot know much more of them. But whilst I doubt my own ability to deal with these subjects I have no doubt whatever as to their importance and the really great responsibility we have in being in a position which may throw light upon them. I think we should all of us, whether expert or layman, continually remind ourselves that the Great Ice Barrier and the inland ice-sheet are unique: there is nothing else in the world comparable to either, and that a right understanding of them must necessarily have far-reaching consequences.

Mr. Frank Debenham has kindly written his recollections of the occasion on which the above lecture was given.

The above paper, the only one of a purely scientific character read by Captain Scott in the course of lectures given in the winter months by the officers, was received with especial attention by the members, as coming from the man among us most entitled to speak on the subject.

Dealing with the most characteristic feature of our surroundings it naturally led to much discussion, continuing until midnight and at intervals for many days afterwards.

The paper illustrates Captain Scott's profound interest and acumen in all Antarctic problems. It proved once more to his hearers how much of the scientific man there was in the naval officer and explorer.

Memory even now recalls the rapt way in which, in the discussion later, he spoke with enthusiasm of the plans for the second year's sledging, the purpose of which was to have been a thorough investigation of all Barrier problems during a long journey across it to the south and east. In fact, he used some such words as these in one sentence: "Ah, when we have finished this Pole business we shall really begin to do some good scientific work." For of all the local features he was most interested in that strange floating plain of wind-swept snow of which, on his return from one cold trip, he said, "Ugh, the Barrier is no place for a Christian gentleman."

The subsequent discussion turned on two principal points in the paper: the cause of the rapid movement of the Barrier, and the nature of the melting effect of the sea-water underneath it.

The suggestion by Dr. Simpson, amplified to a theory by Captain Scott, that the movement might be due to the spreading effect of such a large viscous mass of snow, came in for particular discussion, chiefly by Dr. Wilson, Simpson, Wright, and Nelson; but the general truth of the hypothesis was less in question than the details of the calculations involved, and the Scott theory bids fair to become the basis of future scientific argument on the matter.

The balance of temperature to salinity, and their combined effect on the under surface of the floating mass, was a less definite problem, depending largely on whether there was a circulation of water underneath; but Nelson's data already gathered in McMurdo Sound were called upon, and the matter threshed out to its limits. It was certainly one of the most striking of the lectures given, and the fact that these notes are written entirely from memory three years later perhaps adds weight to that statement.

F. D.

THE RECLAMATION OF A DESERT.*

By GODFREY SYKES.

THE increasing relative importance of the arid portions of the Earth's surface has been the theme of many writers of geographical papers in recent years, and for the modern student of geography the interest in deserts lies in their exploitation rather than their exploration. Desert occupation and reclamation have indeed taken place under local racial or competitive pressure from the very earliest times, but it is only in the light of the modern appraisement and stocktaking of human opportunities and resources that any just appreciation of the prospective value of such regions has been possible, or the importance of eremography as a branch of geography fully realized.

* Map, p. 492.

It has been urged with some reason that mankind will in the end be forced to utilize desert wastes as dwelling-places and industrial centres, thus releasing all more fertile areas for food production; but for the present the reclamation and development of such portions as are available is a more pertinent question, and a record of the progress which is being made in this direction is very desirable. Advances in dry-farming have made feasible the invasion of the edges of semi-arid areas, and it has become economically possible to bring more and more costly works to bear for desert development as land values in adjacent fertile districts have increased. California has furnished many excellent examples of such projects, and none perhaps more striking than the work now being carried out in the Colorado desert. The development has in this case been extremely rapid in spite of many difficulties foreseen and unforeseen; and the reclamation has afforded some interesting examples of the kind of engineering and administrative problems which may confront those who would undertake similar schemes for making two blades of grass grow where but one grew before. The geographical features of the region are somewhat unique and have in a way both helped and retarded development. Political considerations have also exerted a disturbing influence inasmuch as the Mexican boundary-line crosses the district at a critical point, and questions of great urgency have arisen which could only be satisfactorily settled by international understanding and agreement.

The surface relief of California may be broadly characterized as consisting of alternating mountain masses and included valleys or open plains whose axes coincide in general with that of the coast line; but this topographical continuity is interrupted by the transverse system of mountains and lesser ridges which mark the southern termination of the great central valley, culminate in the San Antonio and San Gorgonio peaks, and then extend in the form of more isolated and smaller ranges across the eastern portion of the State to the banks of the Colorado River. This lessening barrier forms the northern boundary of the great irregular triangle of the Colorado desert, of which the eastern and south-eastern sides are respectively formed by the line of the lower Colorado and the bold escarpment of the San Jacinto Mountains. The main and central portion of the area thus enclosed is in reality the north-western extension of the submarine trough of the Gulf of California, from which it has been separated by the broad alluvial plains of the Colorado delta. Its present form is that of a huge spoon, the deepest point in the bowl being some 280 feet below sea-level.

There is evidence upon every side that the geological changes responsible for the formation of this basin have been very recent ones, important modifications in the conditions therein having doubtless taken place within a period measurable by hundreds rather than thousands of years. The outline map (inset on general map, p. 492) will serve to show the general situation, and it will be seen that the Colorado river has originally emptied into the gulf at such a point and in such a direction as would cause its

heavy load of silt to be deposited as a gradually increasing barrier across the trough, until the tip reached and amalgamated with the slopes of the peninsular mass now represented by the Cocopah Mountains. The dam once formed the basin to the north-west would gradually lose its marine and assume a lacustrine character, dependent for its maintenance as a lake upon the Colorado River, but doubtless subject to great changes of level, or even complete drying up through evaporation, as the various phases of delta building took place. There is abundant collateral evidence that such fluctuations have been frequent. The delta building has progressed well beyond the stage of a mere shutting off of the sea, since the lowest point in the dam is now about 28 feet above mean sea-level and lies close to the foot of the Cocopah Mountain slope. The net result since the final exclusion of the sea has been the deposition of a great prism of rich alluvial matter upon the basin side of the dam and the final diversion of the river towards the Gulf.

As far as our present knowledge goes there is no record of a complete filling of the basin having taken place since it was first approached by the Spaniards in 1540, but the inaccessibility and great aridity of the region were such as to render the acquisition of knowledge concerning the geographical conditions therein a matter of extreme difficulty. Don Juan de Onate reached the Colorado in 1604, Father Kino in 1702, and Font, Garces, and others later in the eighteenth century; and there is good presumptive evidence that some expedition must have passed from Sonora to the Pacific coast during the last quarter of the sixteenth century, leaving traces of its work upon various contemporary maps. For all practical purposes, however, the first real information concerning the Colorado desert was that made available by the publication of the results of the Williamson expedition in 1853 in search of a practicable route for a transcontinental railway. The late Prof. William Phipps Blake accompanied this party as geologist, and his report brought out clearly the leading facts regarding the basin and the dominant part played by the Colorado in its formation.

As emigration to the Pacific coast increased during the sixties and rendered regular mail and passenger facilities necessary, an overland stage service was inaugurated which passed across the western side of the delta towards the infant settlements of San Diego and Los Angeles, and this continued in operation until superseded by the Southern Pacific Railway in 1872. The Blake report and other slowly accumulating data had made it apparent that the region, in spite of its evil reputation for intense heat, desolation, and lack of water, possessed boundless possibilities for agriculture if only the water of the Colorado could be brought into it; and so various schemes were formulated for such development. Lieut. Bergland, of the United States Army, suggested and worked out in some detail in 1875 a plan very similar to the one finally adopted; but most of these earlier schemes merely had in view the admission of water

to the basin for filling the whole portion below sea-level, and trusting to the presence of such a great lake in the midst of the desert for some amelioration of the climatic conditions.

As the modern science of irrigation was developed it was realized that immeasurably greater returns could be obtained by admitting the water under proper control, and utilizing the whole available area for the production of crops. The problems involved were however so great, and transportation and climatic difficulties still so serious, that Californian energy was for many years absorbed in smaller, simpler, and safer schemes; and this one, in spite of its evident possibilities, was allowed to lie dormant.

The Colorado River has not only created but has since their formation been a constant menace to the rich alluvial slopes of the basin. It is a great and powerful stream, with a total drainage area of over 263,000 square miles, its main sources of supply being the western slopes of the continental divide in Wyoming and Colorado. The annual rise is very regular and clearly defined, its peak reaching the delta in the latter part of June, and the water at this season carries a great amount of solid matter in suspension. The average yearly amount of this has been computed as equivalent to a layer 50 feet in thickness and one square mile in area, resulting, of course, in a very rapid up-building of banks and great variations in the level of the river-bed.

It is obvious that the diversion of any portion of a river such as this from the summit of a self-built ridge of soft alluvial matter must present some very serious problems and involve some well-planned and built diversion works if the safety of the lands below is to be adequately assured; but various other issues seem to have so obscured this point as to render the engineers who finally undertook the diversion oblivious to it; and this oversight was in the end nearly responsible for the wreck of the whole enterprise. The gradient of the river through the delta averages about $1\frac{1}{2}$ feet fall to the mile; the country towards the southwest, or diagonally down the delta-cone, has a fall of about $2\frac{1}{2}$ feet per mile, and as the basin itself is approached the fall becomes much greater, about 4 to 5 feet to the mile. Under normal conditions of direct flow into the Gulf of California breaches towards this dangerous slope repaired themselves automatically, since if through a confluence of small overflow drainage channels or other local causes a transriparian flow of any magnitude took place, drift-wood, floating roots and other vegetable matter was carried in that direction and the outlet was soon sealed by this and the muddy water. The comparatively short season of annual flood and the luxuriant growth of vegetation further combined to make such openings generally merely temporary; and for this reason perhaps the danger of a larger breach in the bank, left unclosed at a season of the year when a rising rather than a falling river was to be anticipated, was overlooked.

A chief factor affecting all plans for the basin reclamation was the limitation imposed upon the engineers by the nature and topography of the ground in their selection of a site for the diversion works. The last solid ground to be found upon the west bank is where the lower slopes of a small rocky hill, known locally as Pilot Knob, approach the river. The international boundary line also touches it close below. Pilot Knob, however, stands upon the eastern edge of a low sandy mesa or table-land, which extends some four or five miles farther south and effectually bars the direct route to the basin. Once the south-east corner of this obstruction is passed a natural high-water drainage channel which skirts its southern edge is encountered, and this forms a direct water-way to the valley. The use of the bed of this occasional stream, known as the Alamo river, had formed the basis of the Bergland plan, and was, in fact, the only feasible one. The difficulty lay in the connecting length of canal between Pilot Knob and the Alamo, restricted as it must be for a distance of nearly five miles to the narrow strip of alluvial ground between the mesa edge and the river, with only approximately the same possible fall as the latter. It was feared from the first that this portion might cause trouble through silting up, and this fear was soon amply justified.

A company having been formed, a cutting was made through the river bank in the spring of 1900, and this was furnished with a temporary wooden head-gate to serve until the proposed steel and concrete structure could be placed upon the selected site. A junction was made soon afterwards with the upper part of the Alamo channel, and the latter was dredged and straightened where necessary. The selection of the Pilot Knob gate-site brought this structure upon United States soil, and this was deemed to be important from a legal point of view, although a total distance of some 46 miles of canal and canalized channel must be traversed by the water around the base of the obstructing mesa before it again entered United States territory. Another diversion gate was placed in the Alamo near the basin rim to control and check the flow before admitting it to the distributing channels. The water reached the edge of the basin in June, 1901, and the preparation and irrigation of the adjacent land began almost at once.

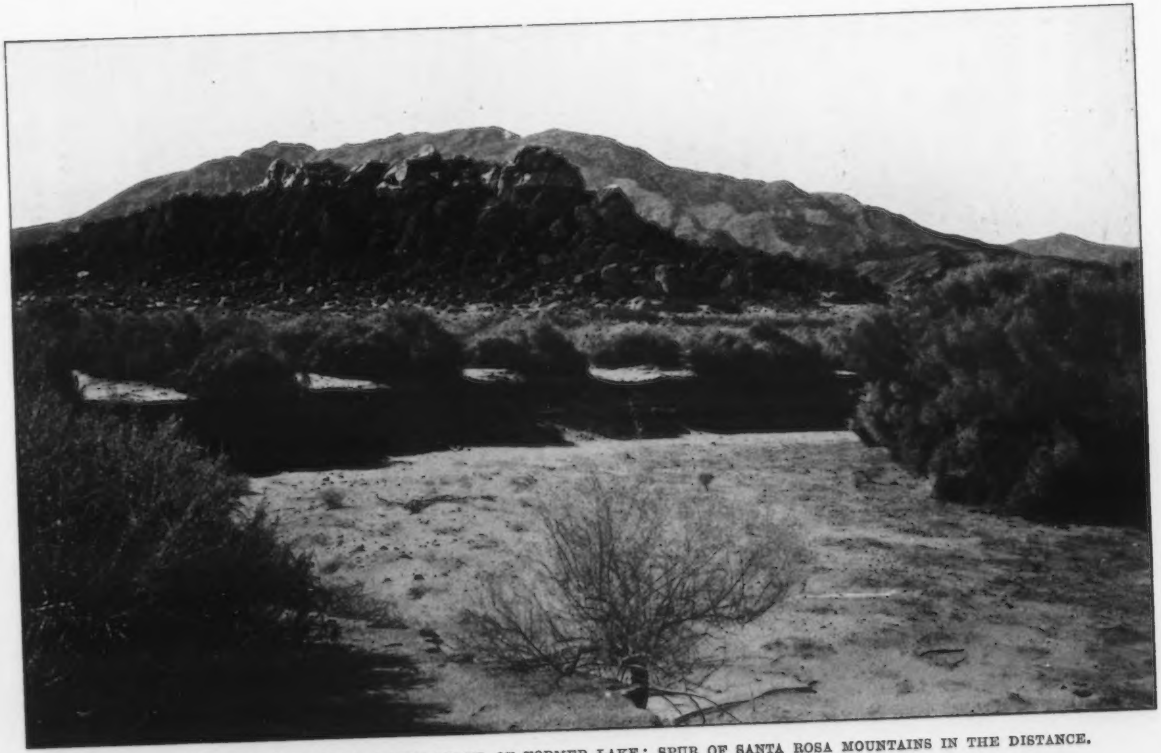
A strenuous advertising campaign had been initiated by the development company for the purpose of attracting settlers, and this, together with the evident possibilities of the basin, was beginning to draw them there in large numbers. A short trial sufficed to demonstrate how potent the natural silting and sealing process of the heavily-charged water of the Colorado was likely to prove in obstructing the intake canal. The settlers were entirely dependent upon this water for their domestic as well as their farming needs, and in such an arid climate the question of keeping them supplied became an extremely serious and urgent one. Dredging had soon proved to be entirely inadequate to keep up with the

growing demand for water, and so before the summer of 1904 two successive cuts had been made between the river and the canal in efforts to reach the latter below the heaviest of the silt deposit. This was supplemented by placing a waste gate about 8 miles down the canal, in order that this length might be thoroughly flushed during the seasons of summer flood, and the deposit carried out through another natural drainage channel lower down the delta. All proved to be unavailing, however. and trouble was again caused by a partial stoppage in the almost level canal and simultaneous shifting of the river channel; so the more desperate expedient was adopted of making a direct cut 6 feet in width from the river to the head of the Alamo, and thus eliminating the intake canal entirely. This was towards the end of 1904, and under normal conditions no rise in the river was to be anticipated until the following April, by which time it was planned to have this dangerous opening properly protected by head gates. Heavy and unusual winter rains in the upper portion of the Gila basin, however, caused a tremendous quantity of flood water to strike this new opening early in 1905, and it was quickly realized that instead of the usual silting-up taking place, the balance had been turned, and the river was now deserting its own channel and entering the direct downward one of the Alamo in ever-increasing quantity.

Desperate attempts were made to conquer the new danger, which threatened to involve in absolute ruin the whole valley, with its rapidly increasing population and wealth. All agricultural development was taking place below sea-level, and if the river were allowed to flow into the basin unchecked there seemed to be no possibility of stopping the rise of the water until it overtopped the natural delta dam, and then by the slow stages of upbuilding was once more diverted towards the gulf, or until a balance was struck between the incoming flow and the loss through evaporation. Four separate attempts were, therefore, made between March and December, 1905, to check the current; but each ended in failure and the breach continued to increase in breadth and depth.

In 1906 a better-planned and more determined effort was made by opening quarries; weaving and laying an immense brush and wire mattress upon the bottom of the opening, which had now increased in width to about 600 feet; pegging this flexible structure down with piling, upon which a temporary railway was carried from shore to shore; and shooting great quantities of the ready quarried rock down upon the mat foundation to form a dam. This plan at length proved successful, and the errant river was once more diverted into its proper channel towards the gulf about the middle of October.

In the meanwhile the troublesome 4 miles of canal had been greatly deepened and enlarged and a permanent and substantial steel and concrete headgate placed at the intake. Success seemed assured. But another



"TRAVERTINE POINT," SHOWING WATER-LEVEL OF FORMER LAKE; SPUR OF SANTA ROSA MOUNTAINS IN THE DISTANCE.

(Photo by Dr. D. T. MacDougal.)

THE ALAMO RIVER NEAR HOLTVILLE DEEPENED OVER 30 FEET BY THE INBREAK OF THE COLORADO, 1905–07.

GENERAL CHARACTER OF UNIMPROVED SANDY AREAS IN THE BASIN.

flood came down from the Gila in the beginning of December, and within twenty-four hours the embankment at the south end of the newly completed dam had been undermined and the river was again flowing towards the basin.

The population of the various prosperous settlements in the valley was now well over 10,000, and it was realized that if these communities were to be saved from total destruction by flood the efforts at closure must be made upon a truly heroic scale, far beyond the resources of the Development Company. Appeals were made to the Federal Government for aid, but it was impossible for the Washington authorities to do anything without due authorization from Congress and an arrangement with Mexico, since the cut between the river and the Alamo had been made upon Mexican territory several miles below the border, under an agreement between the Development Company and a subsidiary Mexican Company. Mexico itself was not vitally interested in making any outlay for the rediversion of the river, as all the damage was being done within the United States. In the basin events were happening quickly. A great lake had already been formed in the deepest part of the Salton Sink which was growing rapidly; the channels of the generally intermittent streams down the delta slope were being deepened and enlarged; distribution canals breached and rendered useless; and over 40 miles of the main line of the Southern Pacific railroad had been invaded by the fast rising water. This company was deeply involved financially in the development and colonization scheme, and its equipment and engineering staff had already been used in the temporarily successful attempt at the closure of the breach during the previous autumn. So in consequence of the extreme urgency of the situation and at the personal request of President Roosevelt it again undertook the task, and plans and preparations were promptly made to complete the work before the arrival of the forthcoming summer flood. The proposals as outlined were truly revolutionary in character. No fascines or mats were to be used, reliance being wholly placed in the ability of the well-organized engineering force to construct lines of trestles across the new and rapidly enlarging break, and from there shoot broken stone down upon the soft and almost soluble bottom with sufficient rapidity and in large enough quantity to control and shut off the water. The fight for supremacy proved to be an arduous one. Work was begun on December 20, and the task of handling the heavy piling demanded by the contemplated loading of the trestles, and in the swiftly running water, which had attained a maximum depth of nearly 40 feet, was pushed forward as rapidly as possible.

Two independent but parallel lines were to be thrown across, each about 1100 feet in length; but before this could be accomplished three separate floods had come down the Colorado and had carried away portions of the nearly finished track aggregating over 1800 feet in length. Hundreds of car-loads of rock had been quarried in the meanwhile and

sidetracked close at hand in readiness for the final effort. One track was at length completed from shore to shore, on January 27, 1907, and at five o'clock the same evening the work of making the dam began. Before daylight the next morning 145 great car-loads of rock, totalling over 6600 cubic yards, had been thrown in and the worst was over. By February 10 the break was closed and the river again following its old channel. Over 55,000 cubic yards of rock were used in actually closing the opening, and much more, together with large quantities of gravel and clay, was deposited upon the upward face before the structure was sufficiently puddled and made water-tight.

The time had been an anxious one for the settlers and railway officials in the valley. Roads and lines of communication had been invaded and rendered impassable; thousands of men were employed in keeping the main line of the Southern Pacific above the rising water and safe from destructive wave action, in spite of numerous further track diversions or "shoo flies"; and work was being rushed in locating and grading for a still greater diversion round the whole threatened region, which would, at all events, place this important transcontinental line out of danger for several years to come. Very serious damage had been done through the cutting backward from the neighbourhood of the new lake of deep cañon-like channels for the two main streams, the Alamo and New River, through which the water was pouring into the basin.

This recessive cutting was very remarkable. The soft alluvial material of which the delta slopes are composed will break down in vertical fragments, and with a loess-like fracture, under the action of running water, when once a breast or face has been formed, and this destructive process was rendering thousands of acres of valuable land absolutely useless for any future agricultural development. The new cañons had reached an aggregate length of some 43 miles and an average breadth of 1000 and depth of 50 feet before the final closure of the great crevasse in the river bank. The town of Calexico upon the United States side of the border line had been seriously threatened, and the twin town of Mexicala upon the Mexican side virtually destroyed. The main flume line across the New River channel had been also destroyed, with the result that the whole region beyond had been deprived of water and, therefore, abandoned. Strangely enough this apparent wholesale destruction has proved to be a most valuable factor in the later development of the region, in providing an adequate drainage system for the irrigated lands; allowing the surplus alkaline matter already in the soil, or brought thereon by the water used in irrigation, to be leached out and carried forward to the natural sump offered by the deepest and salt-impregnated portion of the basin.

During the period of inflow the lake formed in this lower portion had reached a length of some 50 miles, an area of about 450 square miles, and a surface level of about −200 feet; fortunately not reaching much

improved farm land, which as yet mostly lay between sea-level and −150 feet.

The later behaviour of the Colorado in the deltaic region has served to illustrate its condition of unstable equilibrium and to render evident the fact that another serious outbreak of its water down the western side of the delta cone was already inevitable and almost due, from natural causes alone, even without the interference due to the irrigation operations. It was realized that trouble might be experienced in inducing the water to re-occupy the direct channel to the Gulf, as the fast growing vegetation had already invaded and partly obstructed the dry bed, during the time of the diversion into the basin. A careful watch was therefore kept along the western bank, and the United States Government was again asked to safeguard the valuable lands, although the immediate danger seemed to lie in the lower delta and within Mexican territory. Further works were undertaken under a somewhat unmanageable system of dual control; and though much money was spent upon the protective dams and levies there was a lack of decision and promptitude in their construction which resulted in the end in the river taking undisputed possession of the channel which it had elected to follow: that of the Abejas or Bee River, which it still occupies, reaching the Gulf through the Hardy's Colorado. Although this route for the water takes it in reality down the outward or sea slope of the delta cone, it is still so near to the crest as to constitute a menace to the basin. Constant watchfulness has, therefore, been exercised in order to avert danger from this direction, and at the present time the situation may be looked upon as being well in hand.

As soon as the immediate danger from general destruction by flood was past, the development within the basin went on at an accelerated rate, and attention was turned toward the repair and improvement of the distribution system. The circumstances of the heat and general aridity with almost total lack of underground water render the use of canal water necessary all the year round, so that the demand never falls below 25 per cent. of the absolute maximum at any time of year; and this constant but at times relatively small flow, together with the heavily silt-laden water, makes the problem of keeping the main canals and laterals clear a rather serious one. In effect a ditch has to be re-dug about once a year, and so the system has been adopted of digging two parallel and equal channels, using them either alternately or together as circumstances may render necessary; but always with the endeavour to maintain as rapid a flow as possible in one or both in furnishing any required amount of water. The twin system also makes possible any necessary closing of one channel for the purposes of cleaning or repairing, without depriving a district entirely of water.

The once troublesome intake section of the main canal has been so enlarged in cross-section as to materially lessen the speed of the water in passing through, thus forming a settling basin in which a large percentage

of the coarser and heavier solid matter sinks. A fleet of powerful dipper and suction dredges is now kept at work in this portion of the system, and seems to be fully capable of ensuring an adequate flow of water.

Experience has demonstrated that in this district an average water supply of something under three feet per acre of the land under cultivation suffices for all agricultural and urban needs, with a possible total wastage of ten per cent. due to evaporation and seepage before it reaches the consumers. At the present time (June, 1915), the total area under cultivation upon both sides of the international boundary line is about 410,000 acres, and of this total 350,000 acres lie within the United States. The quantity of water furnished in 1914 was about 1,000,000 acre-feet. The present population of the valley is nearly 50,000. The staple crops have been alfalfa (lucerne), barley, and maize, but in the past few years a large and increasing acreage has been devoted to cotton, and this seems destined to prove the most important single crop. Nearly 60,000 bales of excellent long-staple fibre were produced in 1914.

General attention has also been given to the early production of vegetables and fruit, made possible by the climate, and the development of the dairy and feeding industries have also been very important. The two deeply eroded channels of the New River and Alamo divide the region into three main irrigation districts, supplied with water through four main distribution canals: one west of New River, one between the New and Alamo rivers, and two to the east of the latter. Of these two one is a new, so-called "high-line" canal, which follows pretty nearly the sea-level contour along the north-east margin of the basin.

A branch line from the Southern Pacific Railway was carried through the centre or interfluvian district in 1904, and along this line the principal towns have grown up. El Centro, the county seat of Imperial County, has now a population of about 6500, and is the most important of these.

Political upheaval and revolution in Mexico still exist as an obstacle to any satisfactory and effective international agreement over the conservation and use of the Colorado water in the basin and delta, but at the present time a working plan is in operation whereby matters upon the Mexican side of the border are looked after by the affiliated Mexican Company, and minor Mexican officials who may be temporarily in control are placated by various means. In the meanwhile, however, a long projected, much needed, and partially built railway, which will pass through a portion of Mexican territory in reaching the port of San Diego, has been greatly hampered and delayed by the uncertainty of any adequate protection for the Mexican section and difficulty of arranging for financial support under the present chaotic conditions. This alternative route to the coast will, when completed, doubtless prove to be one of the most important factors in the future agricultural and commercial

development of the valley, since it will materially cheapen and expedite communication by way of the Panama Canal with eastern American and European markets.

A still shorter and more direct outlet by way of the Gulf of California, seems for the present to be entirely out of the question; partly on account of the Mexican troubles, but still more so from the total lack of any port facilities or even available harbour sites in the upper portion of the Gulf, which has little-known but most unpromising physical features for any such development: great tides, with accompanying strong currents, shoals, and shifting channels; and generally low alluvial shores, subject at times to heavy inundations.*

MR. STEFÁNSSON'S EXPEDITION.

In the October number of the *Journal*, p. 316, we gave a summary of Mr. Stefánsson's doings as recorded in his despatch to the *Daily Chronicle*, from the time of his separation from the last supporting party on his northern sledge journey of 1914, down to his return to Herschel Island near the mouth of the Mackenzie towards the end of August, 1915. The narrative covered two separate undertakings—the hazardous march of 700 miles over the ice, first north, then east and south-east to the west coast of Banks Island in 1914; and the spring expedition of the present year up the west coast of Banks and Prince Patrick Islands to the new land further north, together with the return by way of Melville Island. Some further items of news have since come to hand, adding a few details to the previous accounts, and briefly outlining Mr. Stefánsson's plans for the further prosecution of his work. A letter from the explorer, written from Banks Island on the return from this year's trip, has been received at the Society, and may here be given in full though it refers only to a part of the whole undertaking, and this merely in summary.† It runs—

"Bay of Mercy, Banks Island, July 19, 1915.

"We are camped here for a few days near McClure's wintering place to rate our watches. It will then take us some twenty days to walk south to our base at Kellett, which will finish our spring journey. We left the home camp February 21, so the trip is already a long one in point of time. In spite of some accidents near the beginning it would also have been a pretty good one in mileage but for the strong

* The writer is greatly indebted, for data concerning this work and the engineering development in the valley, to Mr. H. T. Cory, M.Am.Soc.C.E., who superintended the successful operations for closing the breach in the banks of the Colorado River.

† Possibly an earlier letter may have been despatched, and have failed to reach us.

adverse currents we met west of Prince Patrick Island. We drifted deviously at their mercy; but as this zigzag drifting was much of it on the slope where we could get bottom soundings there was a silver lining to the cloud. Our numerous soundings are located by almost daily sextant observations and are of various depths from 760 to 30 metres. In most cases we preserved bottom samples. We also have a line of bottom soundings running somewhat north of north-west from Cape Alfred, Banks Island, to N. lat. 76°.

"The only signs of the *Investigators* here are a small cairn of sand and stones and half an armful of whole and broken staves of kegs, casks, and barrels. On various beaches of the bay we have also seen small fragments of wood from boxes, barrels, etc.

"On account of our too southerly base, lack of men and dogs, etc., we got into the current area west of Prince Patrick Island only in May, when the weather was too warm to freeze over quickly the leads that formed under the influence of the drift. A drift which stops progress in May might easily be only a cause of slight delay in March. Our main endeavour will therefore be to get across the first 100 miles from the coast of Prince Patrick Island next year while the mean temperature is yet in the vicinity of 30° F.

"We completed the coastline survey of Prince Patrick Island between the farthests of McClintock and Mecham. We reached Cape McClintock on June 15, which I found from a record McClintock left there in 1853 was the very day on which he was there. Three days later we sighted a land of considerable size, the shores of which proved to be only some 10 or 12 miles beyond Ireland's Eye. I do not know if McClintock actually visited Ireland's Eye or only saw it from the next island south—I suppose the latter, as the Admiralty chart (2118) shows the north side of Ireland's Eye dotted in. But even if he did not visit Ireland's Eye, yet he might have seen the large land to the north had the weather been clear. As he was here at the same time of year as we, and as we had scarcely one properly clear day a week, it is not unlikely he had thick weather also.

"I have asked the Department of Naval Service to issue to you a summary of the geographical portion of my report to them.

"Pardon the brevity of this. I have only a few spare pages in my diary and do not expect to be at home this summer long enough to write anything but my report to the Government.

"*Saturday.*—Found a large quantity of barrel-staves, some coal, etc., a mile south of the Cairn, where the *cache* evidently was."

Other letters from Mr. Stefánsson are printed in the *Daily Standard Union* of Brooklyn for October 17. The first is dated from near Cape Kellett, Banks Island, October 11, 1914. He had then had only vague accounts of the fate of the *Karluk* (cf. *Journal*, vol. 44, pp. 233, 591), and

was still in hopes that the crew and scientific staff were in slight danger or none. He gives a vivid description of the difficulties of the ice-journey of the previous spring, saying that the masses of ice over which he and his companions travelled were not seldom less than the size of a city block, and separated by impassable channels. During gales, on the other hand, the ice was piled up in pressure ridges 40 to 60 feet high. During the journey one team of six dogs hauled a load of from 800 to 1440 lbs. for over 700 miles. On reaching Banks Island not a dog had been lost and all were fat. Both in this and in a later letter (or continuation of the first), written on June 25, 1915, from the west coast of Melville Island, Mr. Stefánsson dwells upon the abundant food supply both for men and dogs to be obtained from the seas and lands visited. Down to October, 1914 the cartridges had given on the average 114 pounds of meat and fat to the bullet, and the travellers had lived on their guns for forty-three days on the ice as well as on land from June 25 to September 15; they had a ton of dried meat and 600 pounds of fat laid by, with half of their original 340 cartridges still left. Without their rifles they would have been able to make no trips at all. In the second letter Mr. Stefánsson dwells on the difficulties of this year's trip by reason of the too southerly position of the base, and the adverse currents encountered. In a final postscript, written on August 20, 1915, from Herschel Island, he refers to the "unbelievable story of the *Karluk*," which he had only then heard for the first time.

As mentioned in the October number, Mr. Stefánsson has purchased another vessel, the *Polar Bear*, to assist in the further work of the expedition, and he appears to have sailed north once more almost immediately after sending his despatch to the *Daily Chronicle* from Herschel Island on August 22. On or before September 3 he was again back at Cape Kellett, Banks Island, whence on that date he sent a further message to the same paper briefly stating his plans for the future. On August 4 the *North Star* had sailed north under the command of Wilkins of Adelaide, for either Prince Patrick Island or Melville Island, taking the route *viâ* Capes Alfred and Prattesley (? Wrottesley). He had four men under him. Mr. Stefánsson himself was sailing north on September 3 (the date of the message), with ten whites and nine Eskimo. He had 100 dogs as compared with the 20 of last year, and altogether his equipment and prospects were better than at any time since the *Karluk* drifted away. He hopes to finish the exploration of the ice as far west as 145° W. long. (about 20° of long. W. from the west coast of Banks Island) and north to 82° (more than 4° of lat. N. from the extremity of Prince Patrick Island). He expects to return next year; but as he has supplies to last two years or longer there is no fear of starvation should he not get back at the expected time.

THE SCIENTIFIC WORK OF THE ORDNANCE SURVEY.

PROFESSIONAL PAPERS—NEW SERIES.

No. 1.—"An Account of the Measurement of a Geodetic Base Line at Lossiemouth in 1909, together with a discussion on the theory of measurement by metal tapes and wires in catenary" [Major Johnston, R.E., and Captain E. C. Henrici, R.E.] 1912.

No. 2.—"An Investigation into the Accuracy of the Principal Triangulation of the United Kingdom," by Captain H. St. J. L. Winterbotham, R.E., with an introduction by Colonel C. F. Close, C.M.G., R.E., Director-General of the Ordnance Survey. 1912.

No. 3.—"Notes on the Geodesy of the British Isles," by Colonel C. F. Close, C.M.G., R.E., Director-General of the Ordnance Survey. 1914.

THE publication of a new series of Professional Papers of the Ordnance Survey marks an epoch in the history of this national work. It might be said without offence to the distinguished officers who had within the past thirty years directed the Survey that, being content to look upon its more refined and scientific side as complete, they devoted themselves to the administration of detail revision, and more lately to the very great improvement of the published maps consequent upon the introduction of elaborate colour printing. Since the year 1880, when Colonel Clarke retired from the Survey, scarcely any geodetic work had been attempted until quite recently. Meanwhile General Ferrero had presented to the International Geodetic Association a general report on the principal triangulations, in which he placed the British triangulation in an unfavourable light because of its considerable triangular errors. On the faith of this criticism it had become the fashion to say that the British geodetic work was not precise enough to be worthy of inclusion in the network of European triangulation, or in a discussion of the general figure of the Earth.

In England the question had been the subject of some agitation, and it had clearly become a matter of importance for the national satisfaction that the credit of our triangulation should be re-established by re-measurement or otherwise. So early as 1904 a detailed plan for the re-measurement of the British arc of meridian had been put forward by Colonel Hills and Colonel Close. This plan would have involved the beaconing and observation of a select chain of the old stations, with perhaps the introduction of new; and it was estimated that the work would cost something like £20,000. At a somewhat later date it occurred to Colonel Close that before such a plan was seriously pressed it would be worth while to test the value of the old work by closing it upon a new base, thus providing for a test of its linear accumulation of error. For it had sometimes been forgotten by the critics that the British principal triangulation is not like a modern chain of quadrilaterals, but is a highly complex figure, of which many parts—and those probably the triangles more difficult of measurement and imbued with a larger error—do not enter with any sensible weight into the measurement of the arc of meridian. Acting on the recommendation of the Council of the British Association the Board of Agriculture and Fisheries authorized the then Director-General of the Ordnance Survey, Colonel S. C. N. Grant, to measure a base and connect it with three primary points of the old triangulation in the neighbourhood of Lossiemouth, on the southern shore of the Moray Firth. The first two papers of the new series describe various portions of this enterprise and the conclusions which have been drawn from its results.

The geodetic base was the first to be measured in Great Britain with the aid of invar wires. Those who are interested in this fascinating development of precise measurement will be familiar with the early use of these wires in the field in South

Africa under the late Sir David Gill, as well as with all the splendid work carried out at the International Bureau at Sèvres by Monsieur Guillaume—the inventor of invar and the great apostle of its use in geodesy. They will read with special interest the modifications made by Major Johnston, in command of the Ordnance Survey party which measured the Lossiemouth base in the months of September and October, 1909. The principal differences from the procedure of others may be indicated briefly as follows: The "wire" was actually a tape, on which the end scales were divided directly, thus avoiding the dangerous use of *reglettes*. The standard length was 100 feet instead of 24 metres, in order that full use might be made of the well-studied 10-foot standard bar OI_1. The use of this bar required that it should be re-determined at Sèvres in terms of the International Metre, with which the National Standard Yard had been compared in recent years. This afforded the readiest means of comparing afresh the O.S. standard with the national standard. A new 100-foot base was laid down at the Ordnance Survey Office for the standardization and study of the tape. Certain modifications were introduced into the design of tripods, straining trestles, and levelling apparatus, such as have suggested themselves to those who have used in the field the apparatus of the form designed by Mons. Guillaume. The length of the base as finally calculated has a probable error of 0·025 foot, or about 1 part in 900,000 of its length.

The account of the field work and of the elaborate standardization is completed by a thorough investigation of the theory of the tape suspended in catenary, due to the joint labours of Prof. Henrici, F.R.S., and of his son Captain E. C. Henrici. It is impossible in a brief notice to do justice to this investigation, which deserves long study and careful analysis, for it is not always easy to bear in mind at any point of the treatment just what refinements have been retained and which discarded. The student will find it advantageous as an exercise to re-write and re-arrange the various sections for himself, before he can be sure of having mastered it in all its bearings; and it will be a useful task if some one will make a tabular summary of the effects of errors of different amounts and classes, as a guide to the conduct of field work.

In the examination of the behaviour of the tape apparatus Major Johnston and Captain Henrici discovered the important fact that the system of suspension—sash-cord running over 5-inch pulleys on good ball-bearings—is capable of absorbing by friction a considerable amount of the tension applied; while if steel piano-wire is substituted for sash-cord the suspension becomes so delicate that the tape cannot be held steady for reading. It is therefore of the first importance that the same suspension be used in the standardization and the field measurement—at least until some way is found of keeping the tape steady under frictionless support. The method of anchoring the tape at one end is suggested; but field experience is lacking.

The second paper, written by Captain Winterbotham, has an introduction by Colonel Close, who in 1911 succeeded to the direction of the Ordnance Survey. The account of the operations of triangulation and reduction, with the discussion of the bearing of the results upon the general problem, are highly condensed, occupying no more than twenty quarto pages; and it is possible that some advantage might have arisen from a rather more complete treatment of the theoretical questions involved. The broad result of the investigation is that the linear errors of the old network triangulation of the United Kingdom are of the same order as those found in modern chains of quadrilaterals extending over an equal distance. The discussion shows that the excellent agreement between the calculated and computed lengths of the Lough Foyle and Salisbury Plain bases was not accidental, but is confirmed by the inter-comparison of these bases with those measured at Paris and Lossiemouth. "The influence on modern Figures of the Earth of any re-measurement of the British arc

would be insignificant, and if the money for a British re-measurement were to become available it would be wise to spend it on some other geodetic operation."

The third paper of the series is based upon the Halley Lecture delivered in the University of Oxford by Colonel Close in May, 1914. Its modest title, "Notes on the Geodesy of the British Isles," hardly does justice to the great range and interest of the contents. Within a brief space we have a discussion of the relation between the British and the metric units of length; a summary of our present knowledge of the figure of the Earth, with special reference to the important part which British geodesists have played in its determination; a brief *résumé* of the above-mentioned work on the British triangulation; an important chapter upon levelling; the British determinations of the mean density of the Earth; an account of British gravity surveys; and a very useful summary of the theory of isostasy. The paper is completed by a full bibliography compiled by the Librarian to the Ordnance Survey, which does not, however, give the help which is desirable in one important matter. Clarke's figure of 1866 is probably more widely used than any other determination: the whole survey of Canada and the United States is based upon it. Yet it is not easy to find, for it was published as an appendix to the account of the comparison of standards of length of England, France, Belgium, etc. (1866), and the title-page of that volume contains no indication of the contents of the appendix, or even of its existence.

Colonel Close's Notes contain many good things. He gives a charmingly simple method of determining the radius of the Earth from the closing errors of a traverse. He finds an example of Airy's practical sagacity in his derivation of a good figure of the Earth by bad methods. He is able at last to do full justice to the merits of Colonel Clarke's masterly work on the principal triangulation. "Sir Henry James wrote the preface, but it is right to state, what could not have been stated before Colonel Clarke's death, that Sir Henry James's personal share in the work was of a limited nature, and that though he was a capable administrator, and encouraged Clarke's scientific work, he was not himself a geodesist." It is hard to estimate how great was the loss to British geodesy when Colonel Clarke retired from the service in 1880, and almost from that day abandoned his interest in the subject of which he was the greatest living master.

The history of the early levelling in England is not so well known as that of the triangulation, and here the Notes are of special interest. It is worthy of remark that in 1831 Mr. J. A. Lloyd invented the use of a mirror for reading the bubble without moving his head from the eye-end of the telescope—a device which was lost for half a century. In 1842 General Colby seems to have been the first to show experimentally that the mean height of the sea is far more consistent than that of low water at spring tides, and that mean sea-level is the proper datum for all determinations of height. We are reminded also that the datum for Irish levels is about 8 feet below the mean sea-level, and that all heights on Irish maps are therefore 8 feet too great. There is a familiar statement on the margin of British maps that "the altitudes are given in feet above the assumed mean level of the sea at Liverpool, which is 0·650 of a foot below the general mean level of the sea." But few will have been prepared for the Director-General's candid admission that "this remark need not be taken too literally, for until April, 1913, no proper steps had ever been taken to ascertain mean sea-level." It was not the primary datum only that was unsatisfactory; the old work suffers from a general defect that no care was taken to make the bench-marks stable. The familiar broad arrow is cut upon walls, kerbstones, and gateposts. No primary bench-marks were established, nor did they think to run the primary lines of levelling on solid ground and to avoid mining areas.

The consequence of all this was that when the Royal Commission on Coast Erosion was happily inspired to inquire of the Director-General of the Ordnance Survey whether the British Isles as a whole were rising, or sinking, or tilting, he was able to reply with confidence that there was no information upon the subject; and he was perhaps not surprised to read the Commission's recommendation that steps should be taken to obtain such information for the benefit of posterity.

No time was lost in putting into execution a well-considered scheme for the establishment of tide gauges and of a series of primary bench-marks covering the British Islands. Every care was taken to obtain the best possible advice as to the situation of the gauges and the lines of greatest solidity in the crust of the country. The tide gauge at Dunbar has been at work since April, 1913, and that at Newlyn since April, 1915; a third at Felixstowe is in contemplation. Already a very considerable part of the primary levelling has been completed. The principal instrumental improvements are the adoption of the parallel plate object glass micrometer, and of levelling staves divided on invar. The probable error in the early stages of the work was of the order of a quarter of an inch in 100 miles of levelling; and it is expected that this will be reduced by improvements in the instruments and methods.

Thus for the first time we are given a sure foundation for future inquiry as to movements of our country in reference to the mean level of the sea on our shores; and it is hardly necessary to point out how urgent in the future may be a knowledge of the data which will repose upon this foundation. The tectonic school of geodesists believe that considerable movements of the Earth's crust are still in progress, and that rising or falling are comparable in their effects with coast erosion and building up. It must be a matter of supreme importance to our future to know whether we should be prepared to deal with gradual shallowing or deepening of our ports and estuaries. In the hard times which are coming pure science will have to economize, with the rest of the world; but we most earnestly hope that no forced retrenchment after the war will put a stop to this inquiry of real utility.

When we turn to the subject of gravity surveys in England we are reminded of a phrase in a Cambridge Guide Book that "the history of a certain College is concerned mainly with its foundation." In the experiments at Schiehallion Maskelyne was the first to make a successful determination of mountain attraction and the mean density of the Earth. Captain Kater's determination of gravity with his invariable pendulum made an advance in method which is the foundation of modern work. Since his time much has been done by the British in other parts of the world, and notably in India and the Antarctic; but no serious extension of gravity survey has been made in this country. The gravimetric history of the country ends with Kater and Sabine.

Nor has anything yet been done to put the computation of topographical deflections upon a modern basis. The inter-comparison of the astronomical and geodetic latitudes of the principal triangulation showed that local discordances, though not excessive, are considerable. But these comparisons were made long before the theory of isostasy was heard of. Colonel Close remarks that "all the calculations for plumb-line deflection in the United Kingdom existing up to the present time are probably valueless, and if we are to examine effectively the question of the deviation of the plumb-line in this country we must follow the example of the United States and India. . . . The work has its practical side, but more important than this is the need of satisfying our legitimate desire to learn what is possible of the structure of the Earth on which we live."

We welcome this avowal that a spirit which slept for a generation has now inspired afresh the practice of the Ordnance Survey. Since the outbreak of the war Colonel Close has been occupied with other and more pressing needs of the time; but may we here express the hope that after peace is concluded he may remain in a position to ensure that the scientific work of our National Survey becomes once more thoroughly established as a normal and essential part of its duty to the State.

A. R. H.

REVIEWS.

EUROPE.

The Near East.

1. 'Serbia: Her People, History, and Aspirations.' By Woislav M. Petrovich. Pp. 280. Harrap. 1915. 3*s.* 6*d. net.*
2. 'Modern Austria.' By Virginio Gayda. Pp. 350. Fisher Unwin. 1915. 10*s.* 6*d.* net.
3. 'The War and the Balkans.' By N. E. and C. R. Buxton. Pp. 112. George Allen. 1915. 2*s.* 6*d. net.*
4. 'Arms and the Map.' By I. E. Hannah. Pp. 261. Fisher Unwin. 1915. 3*s.* 6*d. net.*
5. 'Roumania and the Great War.' By R. W. Seton-Watson. Pp. vi. and 102. Constable. 1915. 2*s. net.*
6. 'Bulgaria.' By Frank Fox. Pp. viii. and 206. A. & C. Black. 1915. 10*s. net.*
7. 'Forty Years in Constantinople.' By Sir Edwin Pears. Pp. xvi. and 390. Jenkins. 1915. 16*s. net.*
8. 'The Partitions of Poland.' By Lord Eversley. Pp. 328. Fisher Unwin. 1915. 7*s.* 6*d. net.*
9. 'Poland and the Polish Question.' By Ninian Hill. Pp. 340. George Allen. 1915. 10*s.* 6*d. net.*
10. 'Bohemia under Hapsburg Misrule.' Edited by Thomas Capek. Pp. 187. Revell. 1915. 3*s.* 6*d. net.*

1. The Serbian Attaché to the Court of St. James' has written a book on Serbia which is at once enthusiastically patriotic and extraordinarily impartial; it is, as the author claims in his Preface, "an honest and candid exposition." He admits (page 214) the cruelty and treachery, the jealousy and inordinate desire for power, that have horribly disfigured the history of all the Southern Slavs; and his strongest statements about Austria-Hungary are merely truisms—such as that Count Forgach was "Austria's professional forger" (page 188)—or are supported by the Swiss and Dutch doctors who followed the Austrian retreat on Losnitsa, and "photographed what they found"! (page 205). He owns (page 100) that Colonel Hodges was "a loyal and judicious adviser" of Milan Obrenovitch, though—like all English officers of the time—a foe to Russia, and therefore always working against that right to protect Serbia which, after the Treaties of 1826 and 1829, the Porte had solemnly accorded to Russia.

The formal arrangement of the book, as reflected in the Contents, is not so good as the detailed arrangement. There are really three parts. The Introduction and Part II., "National Beliefs and Customs," make one, largely geographical in character and well repaying careful reading; whilst Part I., "History," is really two parts—a slight and rapid, though vivid and interesting sketch of Serbian history, and a careful and detailed account of recent political and military events. In the latter the author explains why the Serbian ordnance, *being French*, ran short of ammunition in the critical days of last winter when the French were actually short of ammunition themselves. He quotes the impartial

verdict of foreign military critics at the time (page 169), that the decisive battle in the first Balkan war was *not* fought by the Bulgars in Thrace, but by the Serbs at Koumanovo. He shows how an absolute conviction of predestination (page 221) and a "Homeric" knowledge of Serbian story combine to give the people an extraordinary power of courage and patriotism. And he is moderate, if possibly mistaken, in his demands for a Serbian coast, though the title of the old Serb kings which he quotes (page 49)—"By the grace of God, king of all Serbian lands *and to the sea-coast*"—implies that the sea-coast was *not* Serbian legitimately. When cattle take a month to go from Serbia *viâ* Salonika to Genoa (page 23), there can be no question about the Serbian claim to direct access to the Adriatic, but to claim the particular line from Alessio to Durazzo (page 178) is probably a mistake. The natural outlet of the "Albanian Gap" is slightly farther north, where the feature-lines run east and west; and the interested verdict of Teutonic surveyors that the land relief is adverse to railway construction is perfectly valueless against the fact that even in mediæval times the old Roman road through the Gap was used for the regular transport of *iron ore*—which one does not carry in a waistcoat pocket.

The transparent honesty of the book makes one greatly inclined to accept the author's statistics about Albania, though one could wish that the source had been indicated. Apparently there are (page 175) 350,000 Arnauts (Moslem landlords) tyrannizing over more than a million Christians—300,000 Mirdites, of Roman creed; 350,000 Tosks, of Greek creed and Greek sympathy; 250,000 Serbs, of Greek creed, but Serb sympathy; 150,000 Greeks; 100,000 Vlachs, also of Greek creed; 50,000 Bulgars; and 50,000 Turks.

2. 'Modern Austria' is an abridged translation of Signor Gayda's 'La Crisi di un Impero,' with a chapter on Italian Irredentism specially written for the book. It consists of keen observations by a skilled observer of political and social movements, with special interest in the struggle between the German, conservative, ultra-clerical, feudal, aristocracy and the popular movements towards democracy and social independence. Especially interesting is the contrast between the condition of the working people at home and their political action in their Trade Societies. The official statistics of over-crowding in Vienna (pages 315, etc.) are simply appalling—only 9295 out of 133,671 dwellings in the people's quarter have a kitchen as well as a bedroom—yet the same people in their organized socialism are before everything else absolutely national (page 329). "They regard the German Socialists as really Imperialist foreigners who wish to conquer the other races in order to dominate them. . . . In all the industrial centres of Austria the Czechs are labouring assiduously to break the unity of the Labour movement, to shatter the old International Central Organization. . . . Separatist Socialism is now an established movement, living and triumphant. . . . In the last election it gave a mortal blow to the army of Internationalists."

An interesting story is told (page 297) of a French official who suspected that his correspondence was being tampered with by the Austrian police. His wife wrote to a friend in Paris, and said "Je t'envoie la première violette que j'ai cueillie." She did *not* enclose any violet, but *the friend received one!*

3. 'The War and the Balkans' gives a useful, if elementary, sketch of political factors. Emphasis is laid on the "peaceful" activities of German agents, especially in the Press, on the fact that only in Serbia and Montenegro are the dynasties native, and that the German dynasts are everywhere in direct antagonism to the democratic instincts of their people. In spite of an obvious bias towards Bulgaria—for the plea for distinguishing between the people and their prince would be at least equally applicable to the Magyars—the concluding forecast was

sound statesmanship in April—if hopeless now—especially the insistence on the need for the Entente Governments to *dictate* terms. "None of the peoples would allow their governments to cede territory voluntarily, but to accept the terms . . . is a different matter" (page 96). The statement (page 54) that there are 3,000,000 Rumanians in Transylvania is incorrect. There are about 3,500,000 in all Hungary, but only about 1,450,000 are in Transylvania.

4. Mr. Hannah's 'Arms and Map' has a good title, and may—as he hopes in the Preface—"be found of some service to schools," though they are not likely to be encouraged by such novelties as "the Hispanian peninsula." It is an amiable and clear sketch of the obvious racial distributions in Europe; but some statements and implications are very doubtful. For instance, the map shows *no* Slav population in the Temes basin, and the suggestion (page 187), adopted from Professor Andreades, that "the harbour of Porto Lagos" is in every way better suited to the needs of Bulgaria than Kavalla" is absurd, though no doubt the absurdity is veiled somewhat by calling it "Porto *Largo*."

5. Dr. Seton-Watson's 'Roumania,' as one would expect, is a serious and valuable piece of work; and—if the reader bears in mind the author's inveterate prejudice against the Magyars, which prevents his making the same distinction between the people and their rulers as he justly claims elsewhere for Balkan peoples—it is a very useful book, with an admirable Appendix of Statistics (quoted from the *Magyar Statisztikai Közlemények*, and including the 1910 census). Legitimate emphasis is laid on the great importance of Rumania in area, population, trade, and military strength—the latter handicapped last winter by Krupp's refusal to deliver ammunition which had already been paid for. The "detachment" due to Latin culture and spirit, as well as to geographical position, is very well brought out. And there is an honest—if biased—wish to admit that minorities do not exactly thrive in Rumania, that there is a bad agrarian problem, and that the treatment at all events of the Jews needs a special apology. The suggestion (page 95) that Russia wishes for a frontier *west* of the Carpathians is not supported by any evidence or by common sense. And the obvious answer to the claim for a Serbian Banat in order to prevent Belgrade being within reach of foreign guns, is that it was absurd to choose a frontier site for a political capital. Still the wish to be impartial is obvious throughout the book—perhaps nowhere more so than in the naïve suggestions about the Magyar statistics. The statistics themselves are very valuable and well arranged; and there is a clear and careful map.

6. The work which Mr. Fox did as war correspondent for the *Morning Post* during the First Balkan War is at once sufficient recommendation of his 'Bulgaria' and sufficient indication of its attitude. His remarks for the tourist and the economist are practical and suggestive, and his summary of European responsibility (page 202) is admirable. The book is one of Messrs Black's 'Colour Series,' and one or two of the pictures have a real value to the teacher of geography, especially that of the Shipka Pass opposite page 97.

7. Sir Edwin Pears has written an ingenuous, amiable, and blameless volume of reminiscences, but it is not rich in humour nor in evidences that he is a very great—or should we say "very strict"?—judge of human character or political phenomena. The mere fact that, after forty years in the city, Sir Edwin Pears could be completely surprised time after time by any important event, somewhat shakes our confidence in his judgment.

8. Lord Eversley's 'Partitions of Poland' is a very careful piece of historical work, presented admirably, in an intentionally popular form; but its geographical interest is very slight apart from one of its coloured maps, which gives

the present distribution of the Poles. On this the Baltic coastland just north-west of Danzig and the Carpathian foothills just south-west of Cracow are coloured to show Poles forming "50 to 80 per cent. of the total population." In both cases even the lower figure seems to us excessively high. The book is very far from lacking in originality, and some of the author's conclusions seem quite definitely to upset several old delusions, notably some accepted from Carlyle.

9. Mr. Hill's 'Poland and the Polish Question' is at once wider and less scientific, but the author has "a seeing eye and an understanding heart," and he has used both to good effect, especially in the chapter on "The Capitals of Poland." Here he points out how, in each of the three divisions of Partition, "a city of outstanding importance from the national point of view has been included, which seems to focus the patriotic sentiments and aspirations of the unhappy Poles" (page 211). . . . "It is doubtful if the Powers could have conceived any plan by which their dearest wish of crushing out Polish nationality could have been more effectually thwarted." Warsaw, Cracow, and Posen are symbols of "nationality," without which Poland, Galicia, and Posen would be of no more account than many other—unheard-of—provinces of a large empire. In each case, too, he has interesting details to supply. For instance, in Posen, the earliest cradle of Polish nationality, the percentage of Poles grew from about 51 in 1890 to 56 in 1900, and to over 57 in 1910, while that of Germans fell from 50 in 1890 to 44 in 1900, and to under 42 in 1910. And to "guarantee"—with typical arrogance—that the Poles shall not forget, the Germans have blocked the main road from the station into the city with a statue of Bismarck! "This is what greets the visitor on arriving at the cradle of Polish history, and every true-born Pole curses Germany every time he passes it" (page 214). Cracow, the home of Polish culture, is much more beautifully situated than Posen, and lacks the typical touch of German arrogance (page 229). Warsaw, with its extraordinarily fine economic position (page 257), can show a corresponding record of prosperity—having risen in population from *c.* 276,000 in 1872 to 436,000 in 1887, to over 750,000 by 1900, and to 825,000 by 1913. But here too there are discordant notes to aggravate the Pole's keen sense of very real national grievances.

10. 'Bohemia under Hapsburg Misrule' is a collection of papers by various American professors. It is practically concerned with asking "What is Austria?" and answering—with a good deal of meticulous and uninteresting detail—that it is "a land with a German head and a Slavonic body, in which minorities rule and majorities are made to obey." We question the account of the origin of the Slovaks on page 115, which is not made more effective by the gibe at the "pseudo-historians," *i.e.* those who have traced the Slovaks in their retreat from Bohemia after the battle of White Hill.

L. W. L.

'Scandinavia of the Scandinavians.' By Henry Goddard Leach. (London: Sir Isaac Pitman & Sons. 1915. Pp. x., 332. *Maps and Illustrations.* 6*s. net.*) Mr. Leach is Secretary to the American-Scandinavian Foundation. The volume which he has contributed to Sir Isaac Pitman's "Countries and Peoples Series" embraces Denmark, Norway, and Sweden. Each of these countries has a section to itself, following a general introductory chapter on "The Scandinavians." The book does not display quite that intimate knowledge which the title of the series might lead one to expect. Mr. Leach knows his Scandinavia well, but he is an American, and necessarily, perhaps, his view-point is rather that of an outsider than that of a native. The book is packed with information, however, and the illustrations are excellent.

ASIA.

PERSIA.

'A History of Persia.' By Lieut.-Col. P. M. Sykes, C.I.E.,* C.M.G. 2 vols. (pp. xxv., 544; xxii., 565). London: Macmillan. 1915. *With Illustrations and Maps.* 50*s. net.*

The author of this truly valuable work has long been known as one of the leading European residents, travellers, and explorers in Persia, and as an untiring student of Persian affairs, past and present. For many years he has been quietly working towards such a Persian history as he now gives us. Just a century ago Sir John Malcolm published the first serious English history of Persia, and since that time, as Sir Percy Sykes reminds us, "the mystery of the cuneiform inscriptions has been solved, Susa [and many another historic site of the middle East] has yielded up its secrets, and in many directions a notable advance has been effected. Each important discovery has been embodied in some work of special value, but no book has been written dealing with Persia as a whole, and embodying the fruits of this modern research." We are now in a position to understand in some measure the Persian point of view, even in the struggles with Hellas and with Rome; and we may perhaps feel that some of our European notions, in this chapter, entirely derived from Western sources, passions, and prejudices, may need at least a partial revision. We shall probably be more alive to the claim of Persia as a contributor towards, and not a mere enemy of, civilization.

"Having enjoyed the advantage of twenty-one years' residence and travel in Persia," the writer fairly claims an ability "to present certain facts more vividly than would have been possible without the special knowledge thus gained." He also feels and shows that he has acquired a deep sympathy with the Persian race and a share in that understanding which springs from sympathy. His first-hand knowledge of the ground entitles him to correct not a few blunders and misapprehensions due to tradition, fable, and the unexamined work of students in far-off studies, guided by books alone.

The geographical and topographical sections and references—such as the first four chapters—are specially good: not less excellent is the account of Persian customs, language, letters, art, and architecture at various times (*e.g.* chapters xv., xli., liv., lxi., lxv.).

Sir Percy Sykes gives a fresh interest to the first notable Persian period—from the rise of Cyrus to the death of Darius, son of Hystaspes, that "Aryan of Aryan descent," for so long time "king of this wide earth." The Sasanid age—that standing vindication of Persia as a virile power, which could for centuries struggle with Rome, check the Far Eastern expansion of the Empire, and repeatedly shake the Roman hold upon Armenia and all lands beyond Euphrates—also finds careful and sympathetic treatment here.

In the Abbasid period of Muhammadan rule the writer well emphasizes the importance of Persia, for whose interests the overthrow of the Umayyads and the change of capital from Syria to the Tigris, from Damascus to Baghdad, were so important. The Mongol age in Persia and elsewhere, invaluable for European opportunity, was Islam's extremity, and meant the ruin or permanent enfeeblement of the old Asiatic civilizations from China to the Euphrates; to Iran it was terrific; and Sir Percy Sykes is justified in treating the Tartar domination, from the Persian outlook as a cataclysm. No part of this work is more useful than the treatment of the rise and fortunes of the new independent Shiite

* Since the publication of this work Colonel Sykes has been promoted to K.C.I.E.

Persia from the early sixteenth century; it is peculiarly difficult to find an adequate handling of this.

The illustrations are abundant, clear, often beautiful, and always apposite, adding greatly to the value of this history. There are admirable photographs of places and buildings, and historic details; there are reproductions of coins and seals, cylinders and gems, medallions and vases; there are scenes of old Persian life in war and the chase and agriculture, from many periods. Among more than one hundred and sixty full-page pictures it is difficult to make a choice of a few best—almost all are so good. But the "Ararat" (1, 4), the "friezes of the lions" and "archers" at Susa (1, 58, 194), the "Persian garden-carpet" (2, 290), may be instanced.

One may perhaps regret that so much space has been given to early Oriental history before the fall of Nineveh and the rise of the Medes, and that such deep excursions, however attractive, have been made into Greek, Roman, and Arabian matters (see chapters v.–vii., xx., xliv., etc.). And this may be said in spite of the author's explanation that he has desired to furnish his readers with a work self-contained and complete, and with this object has "focussed what is known of the ancient empires in their relations with Elam, Media, and Persia," and "dealt more fully than otherwise necessary with such subjects as the rise of Macedonia." But this *History* is always worth attention, and always arrests it. Sir Percy Sykes has put some of his best work and some of his most charming illustrations into the few chapters that wander far from the main part of his subject; and when all is said, nothing has vitally interfered with the thorough and successful development of his central theme. May his zeal, taste, and care be adequately rewarded.

C. R. B.

India in the Eighteenth Century.

'Rambles and Recollections of an Indian Official.' By Maj.-Gen. Sir W. H. Sleeman, K.C.B. Revised Annotated Edition by Vincent A. Smith, late of the Indian Civil Service. Humphrey Milford: Oxford University Press. 1915. 6*s. net.*

Owing to the scarcity of the original work it was deemed advisable to issue a new edition in 1893, and the continued demand for the book has this year called for a revised edition. Mr. Smith states that the labour of revision has proved to be more onerous than was expected. In the course of twenty-one years since the last edition was published the numerous changes which have occurred in India in administration and other arrangements have necessitated the emendation of notes which had become out of date. The variety of the incidents, information, manners and customs of the prople, and stories of the most different character are exceedingly interesting. Sir William Sleeman was an accomplished Oriental linguist, being well versed in Arabic, Persian, and Urdu, and also, as can be seen from the pages of his work, a good Latin, Greek, and French scholar. His writings display considerable appreciation of science and history, and he was also fond of literature and poetry. His grandson Captain J. L. Sleeman, when stationed in India in 1903 and 1908, visited the scenes of his grandfather's labours, and stated that everywhere he found the memory of his respected ancestor revered; he was assured by many who had known about him that no Englishman had ever understood the native of India so well and helped to effect so many genuine reforms as those to which Sir William Sleeman had devoted his life. In spite of the 137 years that have elapsed since Sir William was born the remarkable annals recorded in his pages help to form one of the most illuminating volumes on India that can well be imagined.

AMERICA.

'In the Oregon Country.' By George Palmer Putnam. (New York and London: G. P. Putnam's Sons. 1915. Pp. xxi., 160. *Illustrations.* 6*s. net.*) Mr. Putnam distinguishes between the eastern and western United States by saying that "Every one is proud of everything out West. Local patriotism *is* a religion." In that spirit Mr. Putnam has strung together a series of literary sketches, descriptive, in the words of his sub-title, of "out-doors in Oregon, Washington, and California, together with some legendary lore and glimpses of the modern West in the making." The book is written in the readable style of a fluent journalist, and contains some extraordinarily good photographic illustrations, which go far to justify the author's enthusiasm for his subject.

POLITICAL GEOGRAPHY.

Nationality and the War.

'Nationality and the War.' By Arnold J. Toynbee. London: Dent. 1915. *Maps.* Pp. xii. and 522. 7*s.* 6*d.*

This is much the most ambitious, and in some ways one of the most important, books evoked by the war, and we hope that no one will discard it at the end of the second or third chapter from distaste either for the interminable "quotations," actually put in inverted commas, from imaginary objectors—who usually state their case extravagantly, and nearly always miss the vital point of their own position—or for the self-complacent omniscience, which plasters the pages with *must* and *will*, but disdains to give authorities even for doubtful statistics. For the book represents an immense amount of careful and patient work on first-rate authorities, some of whom are mentioned on pages viii. and ix.; it has good maps; it is well thought out and admirably presented; it shows a wide, if not deep, knowledge of historical details,—which are cleverly marshalled, a close study of political and economic problems other than those associated with transport, and a real, if not always successful, wish to understand the geographical basis. It is obviously sincere; so far from intentionally shirking any difficulty, it even creates some; and its chapters have been revised by well-known scholars, including Mr. A. D. Lindsay, of Balliol. And yet it is a disappointing book full of ultra-cosmopolitan theories. The author theorizes about the iniquity of any reprisals, even political and economic (page 4), ignoring the fact of the German official statement that "frightfulness" must be "pushed to the utmost, short of provoking reprisals." He theorizes about railways in Arabia and Persia, ignoring the fact that even in the United States really long-distance traffic, *e.g.* transcontinental, except in passengers and mails, is very small: even from Montana to New York or San Francisco the wheat rate (35c.) is prohibitive! He theorizes about a plebiscite in Schleswig, ignoring the fact, about which he cannot theorize, that Schleswig has already suffered from one "free vote"—associated for ever with Bismarck's gibe that "a people who had been so easily deceived once (by his lie in 1864), really deserved to be deceived again."

Geographically, he makes no distinction between nations and nationalities; he has no clear idea of the function of a frontier or of its consequent relation to different geographical features; and most of his suggestions about possible railway development in Arabia and Persia are based on ignorance, though his careful map makes his fantasies look for a moment realistic. But it is significant that not one of his maps shows a scale of miles, and that he does not in the least realize that,

e.g., on Map I. his scale is *c.* 15 miles to the inch, and on Map IV. *c.* 200 miles! And he has something still to learn about tunnelling (page 472).

His proposed devices for remaking the map are the plebiscite and "trust in Germany" and her "solemn pledge" (p. 78), though he admits (p. 484) that she has acted in Belgium "with downright dishonesty." He admits (page 458) that during the last 100 years in the pirate-infested Persian Gulf "the British Navy has swept [the pirates] out of every creek, surveyed the coast, laid down buoys at the harbour entrances and in the channel up the Shatt-al-Arab, and opened the whole of Southern Persia to international trade"—*international*, be it noticed. But (p. 464) he asserts that, unless we now change our naval policy "Great Britain will become as intolerable to her neighbours in the Gulf as Germany and the Ottoman Empire have become to theirs in the Black Sea and the Baltic," and (p. 482) that "to leave Great Britain in control of the Persian Gulf or Suez Canal is much like posting a brigand to guard his professional haunts: set a thief to catch a thief!" It is in keeping with this that, while deploring the absence of any International organization to regulate affairs by sea and land, he ignores the work already done and being done by the British Empire.

On the other hand, he both magnifies and misrepresents the work done by the German overseas "Empire," echoing verbatim the German official statements, and ignoring such known facts as (*a*) that Germany is already *importing* labour at home, (*b*) that her German emigrants do *not* go to German colonies, (*c*) that the colonies are a trade-preserve, not an international market, and (*d*) that they have served as an excuse for demanding a large navy. This is the verdict of German statistics and of German leaders, and as Mr. Toynbee finds it easier than we do ourselves to place confidence in such sources it is unreasonable of him to ignore them.

As we have said, the book has many merits, but its prejudiced special pleading robs it—and deservedly—of the influence which it might have exerted politically in spite of its fantastic excursions into Economic Geography.

L. W. Lyde.

GENERAL.

Bibliography of Atlases.

'A List of Geographical Atlases in the Library of Congress, with Bibliographical Notes.' Compiled under the direction of Philip Lee Phillips. Vol. 3. Titles 3266–4087. Washington. 1914.

Those students, and they must be many, who have gained invaluable aid from Mr. Lee Phillips' monumental *catalogue raisonnée* of the rich collections of Atlases possessed by the Library of Congress (cf. *Journal*, vol. 35, p. 430), will welcome with pleasure the appearance of a third volume, supplementary to the first two, and embracing the titles and descriptions of 822 additional items, mostly acquired since the publication of the first volume. It also contains an author list in which the entries already given in volume 2 are incorporated, with due correction and revision, so that it forms a complete list, by authors, of the whole collection of Atlases contained in the Library of Congress down to 1814; and a general index to the supplementary entries by subject and author, each individual map (where catalogued separately in the body of the work) being entered under the place-name, and also under author's name if this is distinct from the maker of the Atlas. This general arrangement is the same as in the first two volumes. Each entry has its own reference number—hardly placed so conspicuously as could be wished, and never repeated even if the entry extends over many pages—and

those of vol. 3 follow consecutively after those in vol. 1 (vol. 2 comsisting of the index to vol. 1). The primary arrangement is by subject—topographical in the first instance; by the special features dealt with in the case of subdivisions of the main headings; and in chronological order within each class. A table of contents facilitates reference to any particular class, but does not entirely make up for the want of suitable indications, in the body of the work, of the particular section under consideration at any given part of it. On opening the volume at random, the reader has no immediate clue to the country or subject dealt with on the particular pages in view, but only to the author of the Atlas and (sometimes) the date.

Although mainly concerned with recent acquisitions the present volume falls not a whit behind the others in the interest of the items catalogued, and the extra attention given in it to analysis of the contents of the more important Atlases lends it a special value. Of the many rare and interesting works described the most noteworthy is perhaps the copy of Lafreri's Atlas, of which a full list of contents is given, serving as a timely supplement to Dr. Wieder's lists for European copies referred to in the July number of the *Journal* (page 68). Want of space forbids special reference to other individual entries, but enough has been said to show the indispensable nature of the work, which must have involved a vast amount of careful labour.

'Flags of the World.' By W. J. Gordon. (London: Frederick Warne & Co. 1915. Pp. xvi., 256. *Illustrations.* 6*s. net.*) This descriptive and historical account of the flags of our own and other nations is notable for its wealth of illustrations. Of these there are more than five hundred, grouped in thirty-two plates, over a score of which are printed in colours. About three-fourths of the books are devoted to British flags, including not only national flags but municipal flags, yachting and other club flags, the house flags of the leading shipping companies, and signal flags.

THE MONTHLY RECORD.

EUROPE.

New Russian Railway to the Arctic Ocean.—Russia, as is well known, has for years desired improved access to the open ocean, her one northern port—Archangel—being closed by ice for many months in each year, and being besides connected with the centre of the country only by a narrow-gauge, single-track railway running north from Vologda. For some years a project has been on foot for the building of a line to the indentation of the Murman coast on which the old settlement of Kola is placed, this, thanks to the so-called Gulf Stream, being always ice-free. In 1899 a new commercial settlement was founded here, some miles north of Kola, and named Alexandrovsk, the port bearing the name Ekaterine haven. But it has never developed to any great extent and nothing was done towards supplying railway communication southwards until the outbreak of the war gave the matter a new importance. Such a railway is now being pushed forward with great energy in spite of the many difficulties due to the nature of the ground, the absence of population and supplies, and other causes. The route adopted is from Ivanka, south of Lake Ladoga, to Petrozavodsk on the west side of Onega, and thence to Soroka at the south-west corner of the White Sea. It follows the western shores of this more or less closely and then crosses the Kola

peninsula to Kola. The general direction is thus nearly due north from a point some 80 miles east of Petrograd. The country traversed is a wilderness of forest and swamp, though not without natural wealth. Kola has hitherto been merely an *entrepot* for fishermen and hunters. The importance to Russia of such an outlet to waters open throughout the year can hardly be overestimated.

Ice in Danish Waters from Early Times.—From early literature in which reference is made to the state of the ice in winter in the seas round Denmark it has been thought by some that in old times the winters in that region were more severe than they are at the present day. The question is of some importance in its bearing on possible changes of climate within historic times, and the painstaking study of all the available records recently carried out by Mr. C. I. H. Speerschneider is therefore of considerable interest. The results down to 1860 are published by the Danish Meteorological Institute (*Medelelser*, No. 2, 1915), the Danish text being supplemented by a summary in English. The study has been prosecuted uninterruptedly for ten years, and the author has consulted so many works that he thinks that no further information on the subject can be obtained except by accident. The records examined date back to A.D. 690, but the years for which data can be obtained are naturally fewer in early than in recent centuries. From 1760 on there is practically no break. Mr. Speerschneider finds that from 1048 to 1893 inclusive twenty-six winters have been described in terms suggesting unusual severity, their occurrence being from two to three per century in earlier times, and about five per century in later times; the difference being no doubt due to the imperfection of the earlier records. It is important to examine carefully the trustworthiness of the early accounts, and the author finds that this is in many cases open to suspicion. Stories of the complete freezing of the Baltic, or even of crossings effected on the ice over wide channels like the Kattegat, seem often to be greatly exaggerated; moreover, the names of the different channels and seas can be shown to have been applied in old times very differently to the present, while the lack of charts of anything approaching accuracy, before 1539 at least, also led to confusion. The statements of Pontoppidan in 1763 as to the winters in his time are well applicable to present conditions. According to him the formation of an ice-bridge over waters like the Kattegat, Belts, and Sound, was an event that only occurred three or four times in a century, and in the nineteenth century five winters of similar severity are recorded. The writer concludes that there is no reason to believe in any marked difference in ice conditions between the fifteenth century and our own day, except as brought about by the influence of steam navigation in keeping the water open.

ASIA.

Forestry in Korea.—Although a fair proportion of Korea is under forest, its unchecked and unscientific exploitation has much diminished its extent within recent decades, and the need of reform was rapidly becoming urgent when the matter was recently taken in hand by Government, which is now doing excellent work in this direction by means of the energetic Forestry Bureau. An interesting sketch of its activities and of the general position of forestry in Korea is given in the *Transactions* of the Korea branch of the Royal Asiatic Society (vol. 6, Part 1, 1915) by the Rev. E. W. Koons, who has availed himself of official documents and of the aid of the Department in checking his statements. Most of the real forests are in the far north, but there are elsewhere scattered forests of good size, some protected by their inaccessibility, others by their sacred character as surrounding temples or shrines. The largest forest—in South Ham Kyung province—covers over 5000 square miles, the total area under big trees reaching 20,000 square miles,

or about 27 per cent. of the whole surface. The northern forests are mostly coniferous and the southern are composed mainly of broad-leaved trees. Bushes and small trees occupy about 35 per cent., while about 22 per cent. is waste land open for afforestation. A beginning of systematic planting was made in 1907, and by 1913 over 300 seedling stations had been established under Government auspices. Private enterprise, represented almost entirely by two bodies which aim at raising material for railway and other construction on a large scale, has already to its credit the planting of 38 million trees, over an area of 47 square miles. Planting by the people for memorials accounted in 1913 for no fewer than 12 million trees, the day specially observed for the purpose being April 3. Apart from the supply of timber afforestation is greatly needed to check excessive denudation and to regulate the flow of the rivers.

AFRICA.

A MS. Plan of Ceuta, 1477.—In connection with the recent celebration in Portugal of the 500th anniversary of the taking of Ceuta by the Portuguese in 1415—a feat in which a distinguished part was borne by Prince Henry the Navigator—our corresponding member, Captain E. de Vasconcellos, publishes in the *Boletim* of the Lisbon Geographical Society the facsimile of a large-scale plan of the place, made in 1774 by J. G. Dechermont and dedicated to the Marquis de Pombal. Comparison with the plan published by the British Admiralty shows that it is remarkably correct, and that the changes that have taken place since its date are but small. Captain de Vasconcellos gives also reproductions of the views of Ceuta to be found in Braun and Hogenberg's 'Civitates Orbis Terrarum,' in Blaeu's Atlas (evidently copied from the first), and in Niebuhr's Travels. He points out the remarkable parallel between the situation of the place and that of Gibraltar, which gives it strategic importance, and refers briefly to the main episodes in its history. After remaining in Portuguese hands until 1580, it then passed under Spanish rule and has so remained down to the present. Of old an emporium of Eastern trade, it may yet recover something of its former commercial importance.

AMERICA.

Philadelphia as an Industrial Centre.—An instructive article by R. M. Keir in the *Bulletin* of the Philadelphia Geographical Society for July traces the causes of the growth of the city from early times into the important industrial centre it now is. Its early Quaker inhabitants, though well trained in trade and business, had no natural bent towards manufactures, the impulse in which direction was supplied by the Dutch and German immigrants skilled in weaving, spinning, paper making, and other arts. The happy combination of the two peoples was the germ of the city's future greatness. Its position, on the other hand, gave it special advantages from the point of view of transportation—alike by sea, river, canals, roads, and railways. Easily reached by ocean shipping and benefited equally by its situation 100 miles towards the interior, it gained commercial pre-eminence which was only lost when the Erie Canal put New York into direct communication with the West, and even then it retained its importance in the matter of shipbuilding and allied industries. Other manufactures have thriven because its communication with the ocean favours such as depend on imported raw material, or export most of the finished product. Among the former are the textile industry, the tanning of goatskins, and the making of linoleum; among the latter the construction of locomotives, steel armour plate, and bridges. Even though some raw materials now come *viâ* New York, the excellent railway connection with the latter has made it unnecessary to remove the factories, and with the growing importance of the export of manufactured goods rather than raw produce

Philadelphia's capacity to supply outward freight of the former kind will serve it in good stead. Water communication with the interior is provided by both the Delaware and Schuylkill rivers, the latter coming from the great anthracite coal-field and so giving ready access to cheap fuel. The combined water front afforded by the two rivers extends to 25 miles. By railway the city is in easy touch with the Great Lakes, the Atlantic, and the Mississippi, and the three principal companies that enter it operate between them 114 freight stations within its limits. In earlier days the position of the city at the passage from the piedmont Plateau to the coastal plain gave it unusual facilities for the use of water-power, and even now the influence of this may be traced in the location of the manufacturing areas. The advantages enumerated in the latter part of the paper—the abundant home-markets, labour supply, cheap food, and the like—are less the result of geographical conditions than the outcome of the primary advantages conveyed by these. Cheap food, however, is in part to be attributed to the position of the city on the border line between the two natural regions above noted, the diverse soils of which favour the production on the one side of cattle and corn, on the other of fruit and vegetables.

American Research in South America.—The return of Prof. H. Bingham to the United States from his fifth expedition for archæological and geographical work in Peru is recorded in the October number of the *Bulletin* of the American Geographical Society. The scene of his operations was once more the region of the Apurimac and Urubamba valleys and the adjacent divides. Of his various assistants Messrs. Cook and Gilbert of the Department of Agriculture returned with him, bringing many specimens of new plants and ancient food plants: Mr. Heller, who was to return late in October, had made a large collection of mammals and birds: Mr. Hardy has brought home with him a Quichua Indian, from whom he is learning the native tongue. Three members of the expedition were remaining in Peru some time longer. Information has also been published (*Univ. Pennsylvania Museum Journal*, Vol. 6, No. 1) on Dr. Farabee's expedition, of the earlier stages of which some account was given in the *Journal* last year (Vol **44**, p. 101). After printing a letter from Dr. Farabee describing the journey on the southern borders of Guiana, the *Museum Journal* goes on to speak of the traveller's further doings after recuperating last year at Barbados. Between July and October, 1914, he was engaged in an expedition to the upper Amazon basin, making investigations of the tribes dwelling on the Ucayali and other rivers. Amongst his collections a large one of the decorated pottery of the Conebo tribe is specially mentioned. After carrying out archæological researches in Marajo Island at the Amazon mouth he set out in March 1915 for the upper Purus, intending to spend some time about the frontiers of Brazil, Peru, and Bolivia, and to return by way of the Beni and Madeira to the Amazon. The article quoted is profusely illustrated from his photographs, chiefly of native types.

The Bolivia-Paraguay Boundary.—In spite of the progress towards the settlement of international boundaries in South America achieved within recent years, there are some questions that have shown themselves so intractable as to be still awaiting solution. One of these is the boundary between Bolivia and Paraguay, which has long been the subject of negotiation but so far entirely without result. In a printed communication received from Señor Oblitas, Bolivian Consul at Liverpool, it is pointed out that this frontier is often shown wrongly in Atlases and other publications. The writer maintains that the only correct frontier is that which follows the Paraguay from the River Apa (22° S. lat.) to the mouth of the Pilcomayo. It is true, he says, that by the Quijarro-Decoud treaty of 1879 Bolivia resigned the Chaco Boreal to Paraguay in return for the latter's

renunciation of claims north of the latitude of the Apa; but this arrangement fell through. In 1887 and 1894 further attempts were made to settle the question, but the draft agreements were never ratified. A similar fate has befallen the agreement of 1907, for in 1913 it was declared null and void, and a protocol was signed asserting the need of a new treaty of delimitation by direct agreement if possible, but failing this, of a treaty of arbitration on the matter. The above, it must be remembered, presents only the Bolivian view of the question.

AUSTRALASIA AND PACIFIC ISLANDS.

The Intermontane Basins of Canterbury, New Zealand.—The mountain region of Canterbury and neighbouring parts of the South Island of New Zealand is marked geologically by the presence of intermontane basins filled with deposits of Cretaceous and Tertiary age, resting on folded sedimentaries of Trias-Jura age or on volcanic outpourings which overlie them. Opinions differ as to the correct explanation of these features, some (*e.g.* Mr. C. A. Cotton in his paper in this Journal for September 1913) regarding the strata composing the basins as remnants of a former wide covering of Tertiary beds, since removed from the higher and more exposed parts; others (among whom is Captain Hutton) considering them to have been laid down locally in gulfs or straits occupying depressions already eroded in pre-Tertiary time. The question is carefully considered by Mr. R. Speight in a paper read before the Philosophical Institute of Canterbury in 1914, and since published in the *Transactions of the New Zealand Institute*, Vol. 47. Mr. Speight describes the geological features of the separate basins in turn, paying special attention to the Castle Hill or Trelissick basin, between Mount Torlesse and the Craigieburn mountains. In this case he finds that Captain Hutton was not altogether correct in the assumptions on which he based his hypothesis, but that although land did exist in this neighbourhood during parts of the period of deposition it was of different form from that now existing, and that the Tertiary sediments are the remains of a once much more extensive sheet, which may well have been laid down on an old peneplain or plain of marine denudation. His general conclusion from a study of all the basins is that in most of them there is evidence of the nearness of a shore-line, as indicated by the coal-measures, conglomerates, or coarse sandstones occurring at the two ends of the Tertiary series, but that the intervening limestones point to an intermediate deepening of the sea. He therefore thinks that a land, probably in the form of islands, did persist in this region throughout Tertiary times, but that the bulk of the Tertiary beds were laid down on an extensive peneplain embracing the ground now occupied by the Southern Alps. The elevated survivals which projected like islands above the Tertiary sea may have formed sanctuaries in which the Antarctic element in the New Zealand flora was preserved.

GENERAL.

Early Maps.—Two little-known if not unknown cartographical works, of the fifteenth and sixteenth centuries respectively, have lately been described for the first time in print. The first—a nautical chart by Albino Canepa, made at Genoa in 1480—is the subject of an article by Prof. M. Baratta in the *Bollettino* of the Italian Geographical Society for July last, accompanied by a reduced facsimile. In general design it bears much resemblance to other nautical charts of the period, but is notable for the abundance of detail, which refers (if in a lesser degree) to the interior as well as to the coasts of the countries delineated. In this and in other respects it shows a decided relationship to the chart of Count Freducci of 1497. Canepa had previously been known for a chart dated 1489, briefly described

in the Uzielli-Amat catalogue, and owned by Count Sola Busca-Serbelloni of Milan. The earlier version now described is the property of the Des Ambrois family of Turin. It has unfortunately been impossible to compare the two, as the Milan copy could not be found when searched for by Prof. Baratta. The field covered by the Turin copy is Europe south of about 60°, with the Mediterranean and adjacent parts of Asia and Africa; also a part of the Atlantic with its islands, including the conventional representations of Antillia and the other large island to the north of it. In this, as in some other points, the chart recalls that of Grazioso Benincasa of 1482. Under existing circumstances it is interesting to notice that almost the whole Balkan peninsula is monopolized by Bulgaria and Greece. The second work alluded to is a MS. atlas of eight parchment sheets, of just over a century later (1590), which is described by Don A. Blasquez in the *Boletin* of the Madrid Geographical Society, Part 3, 1915. Its author is given as Bertholomeu Laso, who drew it at Lisbon, but of whom nothing seems to be known. Even at this late period in the century, when the printed collections of Lafreri, Ortelius, Mercator and others were widely available, MS. maps and atlases of an older type still maintained their ground to some extent, and the present example has its counterpart in many others long known to students, to some of which its delineations bear a strong general resemblance. Among the maps with which it might with interest be compared are the many Portuguese ones produced by the Homems, Bartholomeu Velho, Gaspar Viegas, and others, but particularly, according to Señor Blasquez, the anonymous atlas in the Biblioteca Riccardiana at Florence reproduced by Kretschmer; the French maps of Desliens and Desceliers; the Spanish ones of Alonso de Santa Cruz, Diego Gutierrez, etc.; and Italian specimens like those of Bartolomeo Olives. The sheet reproduced in the *Boletin*, which embraces Central America and the West Indies, with parts of the neighbouring continents, shows points of resemblance with most of these, especially as regards Yucatan, the Gulf of Maracaibo, and other features. But it is in the delineation of the north coast of Brazil that the relationship of the other maps is most directly seen, and whether this is shown by Laso at all does not clearly appear from the present description.

Sir Aurel Stein's Expedition.—We have received further news of Sir Aurel Stein's Expedition in a letter dated 27 October 1915 from Bokhara. When he sent the long letter printed in the *Journal* for October he was just leaving the Kashgar Mountains for the Pamirs. "Since then," he writes, "I have done three months' almost continuous travelling through the Alai region, across the Russian Pamirs, and then down the whole length of the Oxus through Wakhan, Shughnan, Roshan, and the other Alpine tracts along its right bank. It has been a most interesting journey, if arduous at times, yielding abundant observations about the old geography, ethnography, etc., of a region which by its historical importance has had a special fascination for me since my youth. A few days ago I emerged on the railway at Samarkand, and now I am on my way to Meshed for the winter's work about Seistan. On my whole journey across the Pamirs and thence westwards I have enjoyed every possible help from the Russian political authorities. I could not have been better looked after on our side of the Hindu Kush frontier. Thus it was possible to cover a great deal of interesting ground, more than I had included in my original programme, and in spite of the sometimes serious physical obstacles which high glacier passes and the difficult narrow gorges of Shughnan, Roshan, etc., opposed. In Wakhan I was able to survey, besides an important old trade route, a series of ancient ruined strongholds, etc. Those secluded valleys have preserved a great deal of old world inheritance in the ethnic types, languages, etc., of their inhabitants, and the materials I could collect are ample."

OBITUARY.

Major A. J. N. Tremearne, M.A., LL.M., M.Sc.

Major A. J. N. Tremearne, of the Seaforth Highlanders, M.A., LL.M., M.Sc., Diploma in Anthropology (Cantab.), Scholar in Hausa at Christ's College, Cambridge, recognized Lecturer in Hausa in the University of Cambridge, Barrister of Gray's Inn, who was shot through the heart when storming the German trenches at Loos on September 25, was born in Melbourne, Victoria, in 1877, and studied in the universities of Melbourne, Cambridge, and London. Major Tremearne had been a Fellow of the Society since 1903. He saw active service in South Africa in 1899 with the 1st Victorian Contingent, and subsequently saw varied service in West Africa. Major Tremearne was an enthusiastic and indefatigable student of ethnology and folklore; most of his investigations had been made among the Hausa, among whom he had spent a considerable time on various occasions, not only in Nigeria, but also in Hausa communities in Tunis and Tripoli. He published numerous papers in the *Journal of the Royal Anthropological Institute* (vols. **41**, **42**, **45**), *Man* (vols. **10**, **11**, **12**, **14**), *Folk-Lore* (vols. **21**, **22**), *Journal of the Royal Society of Arts* (vols. **58**, **59**), and elsewhere. His more important books are—'The Tailed Head-Hunters of Nigeria' (1912), 'Hausa Superstitions and Customs' (1913), 'The Ban of the Bori' (1914), and 'Hausa Folk-Tales' (1915). A complete list of his publications will be found in the December number of *Man*. Major Tremearne was a keen and efficient soldier who won the esteem and friendship alike of his brother officers and of the rank and file; his men were willing to follow him anywhere. His versatility was also displayed in music and other arts. He had accomplished a great deal in a relatively short space of time, and his friends confidently anticipated still more valuable work from him in the future.

A. C. H.

Captain R. Bage.

Among the victims of the war in the Near East is Captain R. Bage, who was killed in July during the fighting at the Dardanelles. Captain Bage was a member of Sir Douglas Mawson's Antarctic Expedition, which he joined at the age of twenty-three. He had previously graduated in engineering at Melbourne University, and was a lieutenant in the Royal Australian Engineers. His scientific work while with Sir Douglas is frequently referred to in 'The Home of the Blizzard,' his special departments being the astronomical, tidal, and magnetic observations. In particular he took command of the Southern Party which (as described in the *Journal*, vol. **42**, p. 82) made its way under great difficulties to the neighbourhood of the South Magnetic Pole, where most valuable observations were secured by Mr. Webb, the magnetic observer. On the non-arrival of Sir Douglas Mawson at the base from his tragic expedition with Ninnis and Mertz, he was chosen as one of the relief party arranged for by Captain Davis, and was thus one of those who stayed with their leader during the second year's enforced detention. On the outbreak of the war he joined the Australian Contingent and so went eventually to the Dardanelles.

Warburton Pike.

The news of the death of Warburton Pike will come as a shock to his many friends both in British Columbia and at home. He had spent many years of his life on exploration work in North-West Canada and Alaska, the results of which

he embodied in two books, 'Through the Subarctic Forest' and 'The Barren Grounds of Northern Canada.' In later years Pike lived near Victoria, B.C., spending the working seasons at a mine near Dease Lake in the Cassiar province of British Columbia, with which he had been identified during the last fifteen years. Personally the most modest of men, a keen naturalist, and the best of travellers, he will be immensely regretted in the north-west country by all who knew him, to whom he was always ready to give a helping hand.

O. B.

Dr. Richard Kiepert.

The bearer of an honoured name in German cartography has passed away in the person of Dr. Richard Kiepert whose death has lately been announced. Born at Weimar in 1846 he studied history at Berlin and Heidelberg, and afterwards assisted his still more celebrated father Heinrich Kiepert, whose cartographic works he revised and brought up to date after his father's death. He was for a time scientific director of Reimer's cartographic establishment at Berlin, and took a foremost part in the preparation of Richthofen's Atlas of China. He brought out contoured wall-maps of all the countries of Europe; an atlas of the German colonies (1893), intended specially for official use therein; also a map of German East Africa, besides many special maps of travellers' routes. The map which will, however, be most permanently associated with his name is that of Asia Minor, which embodied all the information available and must long remain the basis of all subsequent maps of that region, as it is of several sheets of the 1/M map compiled at the Society. From 1875 to 1887 he was editor of the well-known serial publication *Globus*.

Barclay Raunkiær.

We regret to record the death from consumption, at the early age of twenty-five years, of the Danish explorer Mr. Barclay Raunkiær, who succumbed to the malady at Copenhagen on July 13, 1915. He was widely known for his journey in Central and Eastern Arabia briefly described in the *Journal* for September, 1912, during which he made his way from Koweit by Bereida to the Wahabite town of Riadh, returning to the coast by way of Hofuf; and as some of the ground had not been touched by Europeans for a considerable time—the route was, in fact, to a small extent new—the journey attracted some attention. It was described in Danish in a volume entitled 'Gennem Wahhabiternes Land paa Kamelryg.'

MEETINGS OF THE ROYAL GEOGRAPHICAL SOCIETY, SESSION 1915-1916.

First Meeting, November 15, 1915.—Douglas W. Freshfield, Esq., President, in the Chair.

Elections.—*Robert Mitchell Berry; Dudley Basil Mackenzie Hume.*

The paper read was:—

"The Southern Frontiers of Austria." By the President.

Afternoon Meeting, November 18, 1915.—Alfred P. Maudslay, Esq., in the Chair.

The paper read was:—

"Distribution of Nationalities of Hungary." By B. C. Wallis.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full :—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Gen. = Genootschap.
Ges. = Gesellschaft.
I. = Institute, Institution.
Int. = International.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
Jber. = Jahresbericht.
k.(k.) = kaiserlich (und königlich).
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science (s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds.
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Albania—Travel. *Le Globe (Geneva)* **54** (1915): 28–36, 36–47. **Briquet.**

De la frontière serbe à l'Adriatique. Voyage en Albanie. By William Briquet.

Mœurs et coutumes des tribus albanaises. By the same.

Austria—Alps. *Z. Ges. Erdkunde Berlin*, 1915: 329–368. **Penck.**

Die Österreichische Alpengrenze. Von Albrecht Penck. *Illustration.*

Austria—Bohemia. **Čapek.**

Bohemia under Hapsburg misrule. Edited by Thomas Čapek. 2nd edit. London: F. H. Revell Comp., 1915. Size 7½ × 5, pp. 188. *Price* 3*s.* 6*d. net. Presented.*

Austria—Bukovina—Ethnology. *Petermanns M.* **61** (1915): 298–301. **Kaindl.**

Die ethnographische Zusammensetzung der Bevölkerung der Bukowina. Von Raimund Friedrich Kaindl. *Map.*

Austria-Hungary—Adriatic Provinces. *Asiatic Rev.*, N.S. **7** (1915): 158–172. **Holbach.**

The land where east meets west: from the Austro-Italian border to Dalmatia and Bosnia. By M. M. Holbach. *Illustrations.*

Austria-Hungary—Carpathians. *Petermanns M.* **61** (1915): 215–217. **Lehmann.**

Die Pässe der Waldkarpathen. Von F. W. P. Lehmann.

Austria and Italy—Political. *Petermanns M.* **61** (1915): 217–223. **Pfaundler.**

Österreichisch-italienische Grenzfragen. Von Richard v. Pfaundler. *Map.*

Austria and Italy—Political. ———

The Italian Green Book. Acts of Parliament Legislature XXIV., Sessions 1913–15. . . . Diplomatic documents submitted to the Italian Parliament by the Minister of Foreign Affairs (Sonnino). Austria-Hungary. London: Hodder & Stoughton (1915). Size 9½ × 6, pp. 96. *Price* 6*d. net.*

Refers to negotiations respecting territorial adjustments between Italy and Austria.

Austria and Italy—Road. **Faure.**

Gabriel Faure. La route des Dolomites, Tyrol et Cadore. Grenoble: J. Rey, 1914. Size 13 × 10, pp. 128. *Illustrations. Price* 20*s.*

Baltic. *Petermanns M.* **61** (1915): 89–91. **Wegemann.**
Die Ostsee als germanisches Meer. Von G. Wegemann. *Map.*
Traces the history of Germanic influence on the shores of the Baltic.

Europe—Frontiers. **Lyde.**
Some frontiers of to-morrow. An aspiration for Europe. By Prof. L. W. Lyde. London: A. & C. Black, 1915. Size 7½ × 5, pp. vi. and 120. *Sketch-maps. Price 2s. 6d. net. Presented.*

Europe—Relief. *Petermanns M.* **61** (1915): 289–294. **Arldt.**
Die positiven und negativen Elemente Europas. Von Theodor Arldt.

Europe—War and Geology. *Petermanns M.* **61** (1915): 249–254. **Kranz.**
Aufgaben der Geologie im mitteleuropäischen Kriege. Von Walter Kranz.

Flanders. *Petermanns M.* **61** (1915): 1–12. **Obst.**
Flandern. Eine geographische Skizze. Von Erich Obst.

France—Brittany. **Chase.**
A vagabond voyage through Brittany. By Mrs. Lewis Chase. London: Hutchinson & Co., 1915. Size 8½ × 5½, pp. vi. and 316. *Illustrations. Price 7s. 6d. net. Presented.*

France—Burgundian Gate. *Petermanns M.* **61** (1915): 49–55. **Langenbeck.**
Die Burgundische Pforte. Von Rudolf Langenbeck.

Germany—North Sea Coast. *Petermanns M.* **61** (1915): 294–294. **Lehmann.**
Die deutsche Nordseeküste als Grenzwehr. Von F. W. Paul Lehmann.

Italy—Lake basins. *Geol. Mag.* Dec. vi. **2** (1915): 403–409. **Preller.**
The moraines and lake basins of northern Italy. By C. S. du Riche Preller. *Illustrations.*

Rumania—Ethnology. *Petermanns M.* **61** (1915): 256–259. **Lehmann.**
Verbreitung und Entwicklung der rumänischen Nation. Von F. W. Paul Lehmann. *Maps.*

Rumania—Historical. *Petermanns M.* **61** (1915): 260–263. **Jorga.**
Die Entwicklung des rumänischen Staatswesen. Von Nikolaus Jorga. *Map.*

Russia—Caucasus. *Alpine J.* **29** (1915): 142–158. **Raeburn.**
In the Caucasus—1914. By Harold Raeburn. *Map and Illustrations.*

Russia—Caucasus. *Alpine J.* **29** (1915): 158–164. **Raeburn.**
The highest peak of the Adai Khokh group, Central Caucasus. By Harold Raeburn. *Map.*

Scandinavia. **Drachmann.**
The industrial development and commercial policies of the three Scandinavian countries. By Povl Drachmann. Edited by Dr. Harald Westergaard. Oxford: Clarendon Press, 1915. Size 10 × 6½, pp. 124. *Price 4s. 6d. net.*

Turkey—Bosporus. *Petermanns M.* **61** (1915): 224–227. **Imhoff.**
Der Bosporus. Von C. Imhoff. *Sketch-map.*

Turkey—Constantinople. **Pears.**
Forty years in Constantinople. The recollections of Sir Edwin Pears 1873–1915. London: H. Jenkins [1915], 1916. Size 8½ × 5½, pp. xiv. and 390. *Portrait and Illustrations. Price 16s. net. Presented.*

Turkey—Dardanelles. *Z. Ges. Erdkunde Berlin*, 1915: 368–378. **Frech.**
Die Dardanellen und ihr Nachbargebiete. Von F. Frech.

United Kingdom—Archæology. ———
Congress of archæological societies, 1915. Report of the committee on ancient earthworks and fortified enclosures. N.P., N.D. Size 8½ × 5½, pp. 13.

United Kingdom—Cumberland—Geology. **Holmes.**
Geol. Mag., Dec. vi. **2** (1915): 410–418.
Evidence as to the Geological Structure of Cumberland on the Solway. By T. V. Holmes. *Map.*

United Kingdom—Durham—Geology. **Trechmann**
Q.J. Geol. S. **71** (1915): 53–82.
The Scandinavian drift of the Durham coast and the general glaciology of South-east Durham. By Charles Taylor Trechmann. *Map.*

United Kingdom—England—Ice-age. *Geol. Mag.*, Dec. vi. 2 (1915): 418–424. **Holst.**
The Ice Age in England. By Dr. Nils Olof Holst.

United Kingdom—Glasgow district. **Gregory and others.**
P. Geologists' Ass. 26 (1915): 276–286.
Report of an excursion to the district around Glasgow. April 1 to 8, Easter, 1915. By Prof. J. W. Gregory and others. *Illustrations.*

United Kingdom—Meteorology. *Q.J.R. Meteor. S.* 41 (1915): 253–284. **Mill and Carter.**
The wet winter of 1914–1915. By H. R. Mill and H. E. Carter. *Maps and Illustrations.*

United Kingdom—Scotland—Carstairs. **Gregory.**
Scottish G. Mag. 31 (1915): 465–476.
The Kames of Carstairs. By J. W. Gregory. *Sketch-maps.*

United Kingdom—Scotland—Tweed. **Gregory.**
Scottish G. Mag. 31 (1915): 478–486.
The Tweed Valley and its relations to the Clyde and Solway. By J. W. Gregory. *Sketch-map and Sections.*

United Kingdom—Survey. **Close.**
Report of the progress of the Ordnance Survey to March 31, 1915. By Col. C. F. Close. London, 1915. Size 9½ × 6½, pp. 11. *Map. Price* 1½*d.*

ASIA.

Central Asia—Tian Shan. *Z. Ges. Erdkunde Berlin*, 1915: 230–234. **Machatschek.**
Gröbers Forschungen im Tian-schan. Von Fritz Machatschek.

China—Chusan group. *J. North-China Branch R. Asiatic S.* 46 (1915): 1–18. **Stanley.**
Putoshan. By Arthur Stanley. *Illustrations.*
Putoshan is one of the outermost of the Chusan group, off the coast of Chekiang, and is an important focus of Buddhist religion and art.

China—Guide. ——
An official guide to Eastern Asia. Trans-continental connections between Europe and Asia. Vol. 4. China. Prepared by the Imperial Japanese Government Railways. Tokyo, 1915. Size 6½ × 4½, pp. cxxiv. and 414. *Maps, Plans, and Illustrations. Presented.*

China—Historical. *J. North-China Branch R. Asiatic S.* 46 (1915): 17–37. **Moule.**
Notices of Christianity in China, extracted from Marco Polo. By Rev. A. C. Moule.

China—Sechuan. *Z. Ges. Erdkunde Berlin*, 1915: 73–91. **Weiss.**
Von O Pien Ting nach Ma Pien Ting durchs Lololand. Von Frau Konsul Weiss.

Dutch East Indies—Moluccas. *Petermanns M.* 61 (1915): 311–314. **Tauern.**
Die Molukkeninsel Misol. Von Odo Tauern. *Map.*

Eastern Asia—Historical. **Yule and Cordier.**
Cathay and the way thither, being a collection of medieval notices of China. Translated and edited by Colonel Sir Henry Yule. . . . New edition, revised throughout in the light of recent discoveries by Henry Cordier. Vol. 3. Missionary Friars: Rasbíduddin—Pegolotti—Marignolli. (Works issued by the Hakluyt Society, Second Series, vol. 37.) London, 1914. Size 9 × 6, pp. xv. and 270. *Sketch-map. Presented.*

Eastern Asia—Travel. **Humphreys.**
Travels East of Suez. By Rachel Humphreys. London: Heath & Co., [1915]. Size 9 × 5½, pp. 224. *Illustrations. Price* 7*s.* 6*d. net. Presented.*
An account of wanderings chiefly in India, Ceylon, and Burma.

India—Himalaya. **Rundall.**
The Ibex of Shā-Ping and other Himalayan studies. By Lieut. L. B. Rundall. London: Macmillan & Co., 1915. Size 10 × 7, pp. xiv. and 152. *Illustrations. Price* 10*s.* 6*d. net. Presented.*

India—Mines. **Department of Mines.**
Department of Mines. India. Report of the Chief Inspector of Mines in India

. . for the years 1894 to 1899; 1901-1903; 1906 to 1912. Size 13 × 8½, Calcutta, 1894-1914. *Maps, Plans, and Illustrations. Presented.*

India—North-West frontier. *Petermanns M.* **61** (1915): 143-145. **Fehlinger.**
Die westliche Grenzgebiet British-Indiens als strategischer Schutzgürtel. Von Hans Fehlinger.

Japan—Economic. *Scottish G. Mag.* **31** (1915): 449-465, 519-531. **Oseki.**
The economic geography of Japan. By K. Oseki.

Japan—Emigration. **Schultze.**
Petermanns M. **61** (1915): 129-133, 175-179, 270-276, 301-308.
Die japanische Auswanderung. Von Ernst Schultz. *Map.*

Malay Archipelago—Java. **Campbell.**
Java: Past and Present. A description of the most beautiful country in the World, its ancient history, people, etc. By Donald Maclaine Campbell. 2 vols. London: Wm. Heinemann, 1915. Size 10 × 6½, pp. xx. and 1236. *Portraits, Map, and Illustrations. Price* 36*s. net. Presented.*

Malay States—Survey. **Jackson.**
Federated Malay States. Report on Survey Department for the year 1914. By Col. H. M. Jackson. *Maps.*

Russia—Caucasus—Morphology. *Z. Ges. Erdkunde Berlin*, 1915: 213-230. **Lehmann.**
Der Stand der morphologischen Kenntniss des Kaukasus auf Grund der neuesten Glazialforschungen. Von Otto Lehmann.

Russia—Transcaucasia. *Petermanns M.* **61** (1915): 309-310. **Dirr.**
Die Bevölkerung des Sakataler Kreises (Transkaukasien). Von Adolf Dirr. *Map.*

Turkey—Altitudes. *Petermanns M.* **61** (1915): 267-270. **Petzold.**
Ewald Banses Höhenmessungen im asiatischen Orient. Von Volker Petzold.

Turkey—Babylon—Historical. **King.**
A history of Babylon from the foundation of the monarchy to the Persian conquest. By Dr. Leonard W. King. (Being vol. 2 of a 'History of Babylonia and Assyria.) London: Chatto & Windus, 1915. Size 10 × 6½, pp. xxii. and 340. *Maps, Plans, and Illustrations. Price* 18*s. net. Presented.*

Turkey—Historical. **Sykes.**
The Caliphs' last heritage. A short history of the Turkish Empire. By Lieut.-Col. Sir Mark Sykes. London: Macmillan & Co., 1915. Size 9 × 6½, pp. xii. and 638. *Maps and Illustrations. Price* 20*s. net. Presented.*

Turkey—Railways. *Petermanns M.* **61** (1915): 264-266. **Imhoff.**
Das Eisenbahnnetz der Asiatischen Türkei vor dem Kriegsausbruck. Von C. Imhoff. *Map.*

AFRICA.

East Africa. **White.**
The rediscovered country. By Steward Edward White. London: Hodder & Stoughton, [1915]. Size 9 × 5½, pp. viii. and 358. *Illustrations. Price* 10*s.* 6*d. net. Presented.*

Describes a visit to a little-known tract abounding in game to the south-east of the Victoria Nyanza. From a geographical point of view its general vagueness as regards routes and places renders it of little value. This lack of precision might be intelligible were the writer desirous of preserving the country as a natural sanctuary, but is a little singular seeing that his professed aim is to open the country to sportsmen.

Egypt—History. **Gosse.**
The civilization of the ancient Egyptians. By A. Bothwell Gosse. London: Jack & Co., 1915. Size 9½ × 6½, pp. viii. and 164. *Illustrations. Price* 5*s. net. Presented.*

French Equatorial Africa. **Cureau.**
Savage man in Central Africa. A study of primitive races in the French Congo. By Adolphe Louis Cureau. Translated by E. Andrews. London: Fisher Unwin, [1915]. Size 9 × 5½, pp. 352. *Map and Illustrations. Price* 12*s.* 6*d. net. Presented.*

German East Africa—Native Cartography. **Weule.**
Petermanns M. **61** (1915): 18–21, 59–62.
Zur Kartographie der Naturvölker. Von Karl Weule. *Map and Illustrations.*

Morocco—Ceuta—Historical. **de Vasconcellos.**
Sociedade de Geographia de Lisboa. Uma planta de Ceuta de 1774. Por Ernesto de Vasconcellos. Lisbon, 1915. Size 10 × 6½, pp. 8 [35–43].
See note in the Monthly Record, *supra*, p. 474.

Sahara. **Gordon.**
A Woman in the Sahara. By Helen C. Gordon. London: Wm. Heinemann, 1915. Size 8 × 5½, pp. xiv. and 354. *Illustrations. Price 6s. net. Presented.*

Sahara—Sand-dunes. *G. Ts.* **23** (1915): 63–75. **Olufsen.**
Sand-ørkenen store el erg i Sahara. Af Ole Olufsen. *Illustrations.*

Tropical Africa. *G.Z.* **21** (1915): 443–453. **Thorbecke.**
Das tropische West- und Mittel-Africa. II. Von Dr. Franz Thorbecke.

West Africa—Climatology. *C.R.A. Sc. (Paris)*, **161** (1915): 142–144. **Hubert.**
Sur les climats de l'Afrique occidentale. By Henry Hubert.

West and Central Africa—Meteorology. *C.R.A. Sc.* **161** (1915): 392–395. **Chudeau.**
La pluie et la tension de vapeur en Afrique occidentale et équatoriale. By R. Chudeau.

NORTH AMERICA.

Canada—British Columbia. **Daly.**
Canada, Geol. Surv., Mem. **68** (1914): pp. viii., 260, and vii.
A Geological Reconnaissance between Golden and Kamloops, B.C., along the Canadian-Pacific Railway. By Reginald Aldworth Daly. *Map and Illustrations.*

Canada—Geodesy. **Reid.**
Department of the Interior, Canada. Publications of the Dominion Observatory, Ottawa. Vol. 2, No. 1. Precise levelling. By F. B. Reid. Ottawa, 1915. Size 11½ × 9, pp. 59. *Map.*

Canada—Quebec. *B.S.G. Québec* **7–9** (1913–15): *passim.* **[Rouillard.]**
Dictionnaire des lacs et rivières de la province de Québec. By E. R.

Canada—St. Lawrence. *B. American G.S.* **47** (1915): 584–593. **Whitbeck.**
The St. Lawrence River and its part in the making of Canada. By R. H. Whitbeck.

Canada—Vancouver Island. **Clapp.**
Canada, Geol. Surv., Mem. **36** (1913): pp. viii., 143, and iv.
Geology of the Victoria and Saanich map-areas, Vancouver Island, B.C. By Charles H. Clapp. *Map and Illustrations.*

Canada and Newfoundland. **Ami.**
Stanford's Compendium of Geography and Travel. (New issue.) North America. Vol. 1. Canada and Newfoundland. Edited by Henry M. Ami. 2nd edit., revised. London: E. Stanford, 1915. Size 8 × 5, pp. xxviii. and 1070. *Maps and Illustrations. Price 15s. net. Presented.*

Mexico—Lower California. *C.R.A. Sc.* **161** (1915): 419–422. **Heim.**
Sur la géologie de la partie méridionale de la basse Californie. By Arnold Heim.

United States—Agriculture. *J.G.* **14** (1915): 1-6. **Cragoe.**
The money value of rainfall in selected crop areas of the United States. By E. J. Cragoe.

United States—Arizona—Snow. **Jaenicke and Foerster.**
Monthly Weather Rev. **43** (1915): 115–126.
Influence of a western Yellow Pine forest on the accumulation and melting of snow. By A. J. Jaenicke and M. H. Foerster. *Illustrations.*

United States—Cincinnati. *J.G.* **14** (1915): 10–12. **Fenneman.**
The site of Cincinnati. By N. M. Fenneman. *Sketch-map.*

United States—Climate. *Monthly Weather Rev.* **42** (1915): 672-675. **Humphreys.**
Warm and cold winters of the eastern United States. By W. J. Humphreys. *Charts.*

United States—Colorado. **Hancock.**
U.S. Geol. Surv., Profess. Paper 90–K. (1915): 183–189.
The history of a portion of Yampa river, Colorado, and its possible bearing on that of Green River. By E. T. Hancock. *Map.*

United States—Cotton. *Monthly Weather Rev.* **43** (1915): 61–64. **Kincer.**
Correlation of weather conditions and production of cotton in the State of Texas. By J. B. Kincer. *Illustrations.*

United States—Ethnology. **Bureau of Census.**
Department of Commerce. Bureau of the Census. Negroes in the United States. Washington, 1915. Size 11½ × 9, pp. 207. *Sketch-maps and Diagrams.*

United States—Fisheries. **Greer.**
Department of Commerce. Bureau of Fisheries. The Menhaden industry of the Atlantic coast. By Rob Leon Greer. Appendix III. to the report of the U.S. Commissioner of Fisheries for 1914. Washington, 1915. Size 9 × 6, pp. 27. *Illustrations.*
Oil is extracted from the fish and the residue used as a fertilizer.

United States—Geomorphology. *Science* **42** (1915): 376–377. **Keyes.**
Valley-fill of arid intermont plains. By Charles Keyes.

United States—Maryland. *Monthly Weather Rev.* **43** (1915): 65–71. **McLean.**
Relation of climate to plant growth in Maryland. By F. T. McLean. *Illustrations.*

United States—New York—Canal. **Schoff.**
B. American G.S. **47** (1915): 321–334, 498–508, 593–600.
The New York State barge canal. By Wilfred H. Schoff. *Illustrations and Map.*

United States—Rainfall. **Wallis.**
Monthly Weather Rev. **43** (1915): 11–14, 14–24, 170–175, 176–178.
Rainfall of the north-eastern United States. By B. C. Wallis. *Maps and Illustrations.*
Distribution of rainfall over the eastern United States. The same. *Maps.*
Distribution of rainfall in the western United States. By the same. *Illustrations.*
Rainfall régime of the several States. By the same. *Illustration.*
These papers, of which a combined reprint has been received, will be specially noticed elsewhere.

United States—Sierra Nevada—Snowfall. **Palmer.**
Monthly Weather Rev. **43** (1915): 217–221.
Region of greatest snowfall in the United States. By A. H. Palmer. *Illustrations.*

United States—Snowfall. *Monthly Weather Rev.* **43** (1915): 2–10. **Brooks.**
Snowfall of the eastern United States. By C. F. Brooks. *Maps and Illustrations.*

United States—Wyoming. **Blackwelder.**
J. Geology **23** (1915): 97–117, 193–217, 307–340.
Post-cretaceous history of the mountains of Central Western Wyoming. Parts I.–III. By Eliot Blackwelder. *Sketch-maps, Diagrams, and Illustrations.*

CENTRAL AND SOUTH AMERICA.

Argentine. **Hammerton.**
The Real Argentine. Notes and impressions of a year in the Argentine and Uruguay. By J. M. Hammerton. New York: Dodd & Comp., 1915. Size 8½ × 5½, pp. 454. *Illustrations. Price* 10*s.* 6*d. net. Presented.*

Brazil—Amazon—Rubber. **Woodroffe and Smith.**
The Rubber industry of the Amazon and how its supremacy can be maintained. Based on the experience of Joseph F. Woodroffe. Edited with additions by Harold Hamel Smith. With a foreword . . . by Viscount Bryce. London: J. Bale & Sons, 1915. Size 9 × 5½, pp. xlviii. and 436. *Portrait and Illustrations. Price* 21*s. net. Presented.*

Brazil and Guiana. *Univ. Pennsylvania, Museum J.* **6** (1915), No. 1: 1–54. [**Farabee.**]
The Amazon Expedition. *Illustrations.*
The geographically most important part of this expedition was referred to in vol. **44**, p. 101 (see also Monthly Record, *supra*, p. 475).

Colombia—Magdalena. **Elliott.**

Up the Magdalena River. By Lilian E. Elliott. (In the *Pan American Magazine*, vol. 19, July, 1914, No. 3.) N.P., 1914. Size 10 × 6½, pp. 7–20. *Illustrations.*

The number is devoted almost entirely to Colombia under various aspects.

Panama Canal. *Queensland G.J.* **28–29** (1912–1914): 23–33. **Brentnall.**

The Panama Canal, its geographical relations and economic uses. By Hon. F. T. Brentnall.

Peru—Archæology. **Bingham.**

Types of Machu Picchu Pottery. By Hiram Bingham. *Illustrations.* (Reprinted from the *American Anthropologist* (N.S.), vol. 17.) N.P. [1915]. Size 10 × 6½, pp. 257–271.

Peru and Ecuador. *Petermanns M.* **61** (1915): 104–106. **Sievers.**

Bemerkungen zur Karte meiner Reisewege in Peru and Ekuador. Von Wilhelm Sievers.

South America—Glaciology. *J.G.* **14** (1915): 49–54. **Schoewe.**

Glaciers and glaciation of South America. By Walter H. Schoewe.

South America—Harbours. *J.G.* **14** (1915): 43–48. **James.**

Harbors of South America. By Henry F. James.

Uruguay—Climatology. **Morandi.**

Institut National Physique et Climatologique de l'Uruguay. Synopsis Météorologique des années 1901–1913. Observations faites dans l'Observatoire Central du Prado (Montevidéo). Moyennes et extrêmes thermométriques de 12 localités de l'Uruguay. Carte pluviométrique de l'Uruguay. Observations de 52 localités. Par Luis Morandi. Montevideo, 1914. Size 12 × 9, pp. 8. *Sketch-map and Illustrations.*

The same. Sinopsis Meteorológica del año 1913. Montevideo, 1915. Size 11½ × 8, pp. 23. *Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

Hawaii—Volcanoes. *B. American G.S.* **47** (1915): 577–583. **Powers.**

Hawaii's great volcanoes and the study of them. By Sidney Powers. *Illustrations.*

Hawaii—Volcanism. *U.S. Geol. Surv., Professional Paper* **88** (1915). **Cross.**

Lavas of Hawaii and their relations. By Whitman Cross. *Map and Illustrations.*

Hawaii—Volcanism. **Jaggar.**

Notes from a volcano laboratory. The "Personal Documents" in the case of Kilauea and Mauna Loa, and how they are translating the laws of earth eruptions. By T. A. Jaggar. (Reprinted from *Science Conspectus*, Boston, vol. 5, No. 4, 1915.) [Boston, 1915.] Size 10 × 7, pp. 85–103. *Illustrations.*

Kermadec and Norfolk Islands—Fauna. **Iredale.**
T. and P. New Zealand I. **47** (1915): 498–508.

A comparison of the land molluscan faunas of the Kermadec group and Norfolk Island. By T. Iredale.

New Guinea—German. *Petermanns M.* **61** (1915): 21–25, 63–66. **Pilhofer.**

Eine Durchquerung Neugineas vom Waria- zum Markhamfluss. Von G. Pilhofer. *Maps and Illustrations.*

Both rivers debouching on the north-east coast, the journey might hardly be called a "crossing" of the great island, though of interest as leading through a considerable extent of unexplored country. It was made in August and September, 1913.

New Hebrides—Ambrym Island. **Marshall.**
T. and P. New Zealand I. **47** (1915): 387–391.

The recent volcanic eruptions on Ambrym Island. By P. Marshall. *Sketch-map.*

New Zealand—Canterbury. *T. and P. New Zealand I.* **47** (1915): 336–353. **Speight.**

Intermontane Basins of Canterbury. By R. Speight. *Sketch-map and Illustration.*

See note in the Monthly Record, *supra*, p. 476.

New Zealand—Franz Josef glacier. **Speight.**
T. and P. New Zealand I. **47** (1915): 353-354.
Recent changes in the position of the terminal face of the Franz Josef Glacier. By R. Speight.

New Zealand—Historical. **McNab.**
Historical records of New Zealand. Vol. 1. Edited by Robert McNab. Wellington, 1908. Size 8½ × 5½, pp. xvi. and 780. *Presented.*
Vol. 2 had been received previously.

New Zealand—Petroleum. *T. and P. New Zealand I.* **47** (1915): 355–360. **Speight.**
Note on the occurrence of petroleum in New Zealand. By R. Speight.

New Zealand—Wellington—Hector Observatory. **Adams.**
T. and P. New Zealand I. **47** (1915): 590–592.
The longitude, latitude, and height of the Hector Observatory, Wellington, New Zealand. By C. E. Adams.

Southern Ocean. **Department of Trade and Customs.**
Biological Results of the fishing experiments carried on by the F.I.S. *Endeavour*, 1909–1914. In Memoriam: H. C. Dannevig, G. W. C. Pim, C. T. Harrison, and eighteen others comprising the crew of the F.I.S. *Endeavour*, who were lost at sea in December, 1914. Sydney, 1915. Size 9½ × 6, pp. 12. *Illustration.*
See note on the disaster in vol. 45, p. 441.

Tahiti. *T. and P. New Zealand I.* **47** (1915): 361–376. **Marshall.**
The geology of Tahiti. By P. Marshall. *Sketch-map and Illustrations.*

Tahiti—Historical. **Corney.**
The quest and occupation of Tahiti by emissaries of Spain during the years 1772–1776. Told in despatches and other contemporary documents. By Bolton Glanvill Corney. Vol. 2. (Works issued by the Hakluyt Society, Second Series, No. 36.) London, 1915. Size 9 × 6, pp. xlviii. and 522. *Illustrations and Facsimile Maps. Presented.*

Western Australia—Warren River District. **Woodward, Simpson, and Farquharson.**
Geol. Surv. B., No. **65** (1915): pp. 52.
The reputed petroliferous area of the Warren River District (South-West division). By H. P. Woodward. With a contribution on asphaltum from the southern coast of Australia, by E. S. Simpson; and a petrological contribution by R. A. Farquharson. *Maps.*

POLAR REGIONS.

Polar Climates. *Geol. Mag.*, Dec. vi. **2** (1915): 450–455. **Deeley.**
Polar climates. By R. M. Deeley.

MATHEMATICAL GEOGRAPHY.

Cartography. *Petermanns M.* **61** (1915): 95-98, 134–137. **Hammer.**
Die Nomenclatur der theoretischen geographischen Kartographie im Anschluss an Prof. Dr. H. Maurers Definitionen in der Kartenentwurfslehre. Von E. Hammer. *Illustrations.*

Cartography—Projection. *Petermanns M.* **61** (1915): 184–186. **Schoy.**
Erdkarte mit Paskalscher Schnecke als Umrandungskurve. Von Karl Schoy. *Maps.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Geophysics—Gravity. *T. and P. New Zealand I.* **47** (1915): 578-583. **Neill.**
On the deflection of the plumb-line from the vertical due to the spheroidal form of the figure of the Earth, and its effect on the latitude of stations above the mean sea-level. By W. J. Neill. *Illustrations.*

Geophysics—Subterranean temperature. **Boussinesq.**
C.R.A. Sc. **161** (1915): 405–409.
Calcul correct de l'influence de l'inégalité climatérique sur la vitesse d'accroissement des températures terrestres avec la profondeur sous le sol. By J. Boussinesq.

Glaciology—Nieve penitente. *Petermanns M.* **61** (1915): 57–59. **Kassner.**

Die Entstehung des Büsserschnees [nach Beobachtungen 1914 in Bulgarien]. Von C. Kassner. *Illustrations.*

Meteorology—Atmospheric electricity. *P. American Phil. S.* **53** (1915): 14–17. **Bauer.**

General results of the work in atmospheric electricity aboard the *Carnegie*, 1909-1914. By L. A. Bauer.

Meteorology—Circulation. *P. American Phil. S.* **54** (1915): 185–225. **Hobbs.**

The rôle of the Glacial Anticyclone in the air circulation of the globe. By William Herbert Hobbs. *Sketch-maps and Illustrations.*

Oceanography.

Conseil Permanent International pour l'Exploration de la Mer. Bulletin Hydrographique pour l'année juillet 1913—juin 1914. (Continuation du Bulletin Trimestriel des Résultats acquis pendant les croisières périodiques et dans les périodes intermédiaires, parties A, B, C.) Publié par le Bureau du Conseil. Copenhagen, 1915. Size 13 × 10, pp. 42. *Maps and Illustrations.*

Oceanography. **Gallé.**

Koninklijk Nederlandsch Meteorologisch Instituut, No. 102. Mededeelingen en Verhandelingen, 18. Luft- und Wassertemperatur im Indischen Ozean. I. Tägliche Periode. II. Verhältnis von Luft- und Wassertemperatur. By P. H. Gallé. Utrecht: Kemink & Zoon, 1914. Size 9½ × 6½, pp. 29. *Maps.*

The same, 19. Waarnemingen in den N. Atlantischen Oceaan in Mei 1914, hoofdzakelijk ter vergelijking van gemeten en geschatte windkracht en windrichting. By P. H. Gallé. Utrecht: Kemink & Zoon, 1915. Size 9½ × 6½, pp. 31. *Illustrations.*

Phytogeography. *J. Geology* **23** (1915): 289–306. **Sinnott and Bailey.**

The evolution of herbaceous plants and its bearing on certain problems of geology and climatology. By Edmund W. Sinnott and Irving W. Bailey.

Radio-activity and Geology. *South African J. Sc.* **12** (1915): 24–32. **Kynaston.**

Radio-activity in its bearing on geological problems. By H. Kynaston.

Address by the President of Sect. B, South African Association, Pretoria, 1915.

Rivers. *G.Z.* **21** (1915): 459–465. **Behrmann.**

Die Formen der Tieflandflüsse. Von Dr. W. Behrmann. *Illustrations.*

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Anthropogeography—Cities. **Geddes.**

Cities in evolution. An introduction to the town-planning movement and to the study of civics. By Patrick Geddes. London: Williams & Norgate, 1915. Size 9 × 6, pp. xvi. and 410. *Sketch-maps, Plans, and Illustrations. Price 7s. 6d. net.*

Anthropogeography—Cities. *J.G.* **14** (1915): 33–38. **Homburg.**

The growth of great cities. By Frederick Homburg.

Anthropology. **Elliot.**

Prehistoric man and his story. A sketch of the history of mankind from the earliest times. By Prof. G. F. Scott Elliot. London: Seeley, Service & Co., 1915. Size 9 × 5½, pp. xvi. and 398. *Illustrations. Price 7s. 6d. net. Presented.*

Colonies—Bibliography. **Hill.**

Royal Colonial Institute Bibliographies, No. 1. A select bibliography of publications on foreign colonisation—German, French, Italian, Dutch, Portuguese, Spanish, and Belgian—contained in the library of the Royal Colonial Institute. Compiled by Winifred C. Hill. With an Introduction by the librarian. London, 1915. Size 8½ × 5½, pp. 48. *Price 2s. 6d.*

Historical—Atlantic Islands. **Babcock.**

Scottish G. Mag. **31** (1915): 261–269, 315–320, 360–371, 411–422, 531–541.

The so-called Mythical Islands of the Atlantic in Mediæval Maps. By William B. Babcock. *Facsimiles.*

Historical—Spanish voyage. **Mazarredo.**

Noticia de la navegación de la fragata de guerra titulada "Santa Rosalia" en el año de 1774. Extracto del Diario . . . hecho por el Ten. José de Mazarredo. Madrid, 1913. Size 9 × 6, pp. 82. *Presented.*

This will be specially noticed.

GENERAL.

Education—Text-book. **Fairgrieve.**

Geography and World power. By James Fairgrieve. London: University Press, 1915. Size 7½ × 5, pp. x. and 356. *Sketch-maps. Price* 3*s. Presented.*

Geography. *Petermanns M.* 61 (1915): 209–212. **Sieger.**

Länderkunde und Landeskunde. Von Robert Sieger.

Travel. **Lewis.**

Sport, Travel, and Adventure. Edited by A. G. Lewis. London: Fisher Unwin, [1915]. Size 9 × 5¼, pp. 352. *Illustrations. Price* 10*s.* 6*d. net. Presented.*

NEW MAPS.

By E. A. REEVES, Map-Curator, R.G.S.

EUROPE.

Austria-Hungary. **Artaria.**

Artaria's Eisenbahnkarte von Österreich-Ungarn und den Balkanländern. Mit 8 Nebenkarten und Plänen und vollständigen Stationsverzeichnis 1915. V. Neubearbeitung, 5. Auflage. 1915. Scale 1: 1,400,000 or 1 inch to 22·1 stat. miles. Size 31 by 44 inches. Vienna: Artaria & Co., 1915. *Price.* 2.40 *K.*

Balkan Peninsula. **Geographical Section, General Staff.**

The Balkans. Scale 1: 250,000 or 1 inch to 3·95 stat. miles. Sheets: Monastir; Uskub. Size 15 by 23 inches. London: Geographical Section, General Staff, 1915. *Price* 2*s.* 6*d. each sheet. Presented by the Director of Military Operations.* London Agents: E. Stanford, Ltd.; Sifton, Praed & Co.; T. Fisher Unwin.

Two sheets of a map of the Balkans, forming an extension of the earlier map of Turkey in Europe on the same scale. Each sheet contains 50′ of latitude and 1° 40′ of longitude, and together the two extend from just south of the Greco-Serbian boundary to about 17 miles to the north of Uskub, and include the country on either side of the Vardar river and the Salonika railway. Contours are given in brown at 250 feet vertical interval up to 2000 feet, after which the interval changes to 500 feet. Wooded land is tinted green. Special care has been taken to indicate the character of roads and tracks, and each sheet contains an explanatory reference to native geographical and other terms employed.

Balkan Peninsula. **Service Géographique de l'Armée, Paris.**

Balkans 1,000,000e (1 inch to 15·78 stat. miles). Sheet: Andrinople. Size 15 by 22 inches. Paris: Service Géographique de l'Armée, 1915. *Price* 1.25 *fr. each sheet.*

This is a new edition. Although entitled the Adrianople sheet, the area extends from Bucharest to the Bosporus and the coast of the Black Sea.

Europe. **Robertson and Bartholomew.**

An Historical Atlas of Modern Europe from 1789 to 1914, with an Historical and Explanatory Text by C. Grant Robertson, M.A., C.V.O., and J. G. Bartholomew, F.R.S.E., F.R.G.S. Size 14 by 11 inches. Oxford: University Press, 1915. *Price* 3*s.* 6*d. net. Presented by the Publishers.*

A cheap and useful atlas consisting of thirty-six coloured maps preceded by twenty-four pages of explanatory and historical text, dealing with the development of European history and changes in international and territorial boundaries during the last one hundred and twenty-five years. The publication is most opportune, and in studying the numerous geographical, ethnographical, political, and historical questions that are constantly arising in connection with the present disturbed state of Europe, it should be of considerable value and assistance to those who have not ready access to the larger and more expensive works. The first four maps deal with the continent as a whole, or the greater part of it, and show the orographical features, density of population, ethnography, and industrial conditions. Then follow maps of the Mediterranean countries in 1789 and 1914, and afterwards a series of maps of the different countries, clearly defining the boundaries at various dates so far as the small scales will permit.

The maps of France, Germany and Italy are specially interesting. Of the latter country there are four maps on the same scale showing boundaries in 1789, 1810, 1815,

and 1914. The Balkan States maps are also important, as are others that might be referred to. The atlas is not entirely confined to Europe, but deals also with the extension of European countries and influence in Asia and Africa. The last map is one of the whole world showing colonial possessions in 1914. It is rather to be regretted that Mercator's projection was chosen for this, since it gives no idea of the relative areas of these possessions.

Europe. **Service Géographique de l'Armée.**

Carte du Theatre des Operations (Front Oriental) avec Repertoire Alphabetique. Scale 1 : 1,000,000 or 1 inch to 15·78 stat. miles. 20 sheets, each 10 by 15 inches. Paris : Service Géographique de l'Armée, [1915].

Similar in style and general appearance with the map of the western theatre of war by the same department noticed in the *Geographical Journal* for June, 1915, except that that was on twice as large a scale as the present map. The area included extends from Vienna to Kiev, and from Petrograd to Bucharest, with the exception of the shores of the Black Sea and districts immediately adjacent. The map consists of twenty sheets in a portfolio.

Roads are in red, railways in black, and an attempt has been made to indicate relief by shading. It is not a very clear production, and in many parts of the map the number of small closely written names under it almost illegible. As in the case of the earlier map, an alphabetical index to place-names is given at the end.

Flanders. **Gross.**

The Daily Telegraph War Map of the New British Front in contour colouring (No. 13). By Alexander Gross. Scale 1 : 100,000 or 1 inch to 1·57 stat. miles. Size 38 by 27 inches. London : Geographia, Ltd., 1915. *Price 2s. 6d. net. Presented by the Publishers.*

France. **Service Géographique de l'Armée.**

Carte de France et des Frontières à 1 : 200,000 (1 inch to 3·2 stat. miles). (Type 1912.) Sheets : 5, Maubeuge-Bruxelles ; 28, Strasbourg ; 35, Vesoul. Size 17 by 26 inches. Paris : Service Géographique de l'Armée, [1914]. *Price 2 fr. each sheet.*

A comparison of these sheets with the earlier editions show that a considerable amount of revision has taken place. The names have been entirely rewritten and rearranged, and new ones added. Roads, which are in red, have been revised to the date of publication. Relief is shown by contours, at 20-metres intervals, in brown combined with neutral tint-shading. As only a comparatively few sheets of the new 1 : 50,000 map of France are so far published, the chief importance of this map consists in the fact that it is the only one at the present time on anything like a large scale that shows contours, although these cannot be considered very reliable and are so illegible that in some parts it is almost impossible to follow them.

Poland. **Lipkowski.**

Historical Maps of Poland. Compiled by Joseph de Lipkowski. Scale 1 : 8,250,000 (1 inch to 130·2 stat. miles) and 1 : 16,500,000 (1 inch to 260·4 stat. miles). Sizes 9 by 9 and 4½ by 4½—Ethnographical Map of the Slavs of Central Europe. By Joseph de Lipkowski. Scale 1 : 10,000,000 or 1 inch to 157·8 stat. miles. Size 8 by 8 inches. Paris : Rédaction de la revue "Polonia," 1914.

A small portfolio containing two sheets of coloured outline maps. On the first sheet are eight maps of Poland showing the boundaries in 1025, 1634, 1772 (two maps), 1793, 1795, 1807, and 1815, while the second sheet is an ethnographical map of the Slavs of Central Europe. Tables of areas and populations are also given.

Spain. **Deposito de la Guerra.**

Mapa Militar de España en escala de 1 : 100,000 (1 inch to 1·59 stat. miles). Levantado por el Cuerpo de Estado Mayor del Ejército y publicado por el Deposito de la Guerra. Sheets : 213, 214, 215, 232, 233, 234, Isla de Mallorca. Size 17 by 19 inches. Madrid : Deposito de la Guerra, 1914.

The first sheets of a new map of Spain, the publication of which has been commenced by the Spanish War Office. It is intended that the map shall eventually consist of 345 sheets, but those received so far embrace only the island of Majorca. According to the index eleven others are more or less in preparation ; the work in the field for one of these is completed, and for the other ten it is still in progress. The map is primarily for military purposes, and the surveys are being carried out

under the direction of engineer officers. The projection is stated to be polycentric. Each sheet is separately projected by drawing the parallels as equidistant horizontal straight lines, and the meridians by straight lines converging towards the top of the sheet in the direction of the central meridian. This is much the same as the trapeziform projection on which many of the early maps of Ptolemy's atlas were drawn; and whatever may be said of it for a single sheet map of a small area it certainly is not suitable for a map in many sheets, since the meridians away from the centre do not cut the parallels at right angles and it is impossible to join the sheets together. The prime meridian from which the longitudes are reckoned is that of Madrid. The centesimal system of graduation has been adopted, and each sheet comprises 40 centesimal minutes of latitude and 60 of longitude. Ordinary graduation into degrees and ten minutes is also indicated. Relief is shown by contours in brown, at 50-metre intervals, combined with neutral tint-shading, the resulting effect being not altogether satisfactory since the somewhat dark shading tends to obscure the contours, the lines of which are very fine. It is not easy to determine the height of any point of land, since the contours are not numbered and only comparatively few spot heights are given. Neither is there any statement on the sheets of what the contour interval is, and it is only after considerable trouble that it can be ascertained. Roads and railways are in black, water blue, and wooded land green.

As regards the roads, except that some are in narrower double lines than others, there is no means of ascertaining their relative importance or quality. A note on each sheet giving this information would be an advantage.

Not more than about one-seventh of the total number of sheets of the 1:50,000 map of Spain are published, although it is many years since it was commenced, so that a large-scale topographical map of the country is greatly needed. If this present map could be pushed on rapidly, and the whole published within a reasonable time, it would, to a great extent, meet a want experienced by many.

ASIA.

Palestine. **Smith and Bartholomew.**

Atlas of the Historical Geography of the Holy Land. Designed and edited by George Adam Smith, D.D., LL.D., LITT.D., and prepared under the direction of J. G. Bartholomew, LL.D., F.R.S.E., F.R.G.S. Size 15 by 10 inches. London: Hodder & Stoughton, 1915. *Price 25s. net. Presented by the Publishers.*

This important atlas was originally planned by the authors so long ago as 1894, but Dr. Smith states in his preface that other literary work and the duties of his office have prevented him from completing his share of the work until now. During the interval considerable progress has been made in the study and investigation of the history and archæology of Palestine and the ancient world generally, and there has been more time for the fuller discussion of earlier material, so that the delay has not altogether been a disadvantage. From the historical and Biblical point of view there are few who are so well qualified to produce a work of this kind as Dr. George Adam Smith, while the high quality of Dr. Bartholomew's cartographical work is well known.

The atlas consists altogether of sixty-two sheets of coloured maps, and is divided into four parts as follows: Part I., Bible Lands in which on eight sheets are represented the principal countries and empires of the ancient world. Part II., General Maps of Palestine, among which is the important orographically tinted map of the country on the scale of ¼ inch to a mile in eight sections, a general orographical map of Palestine, with means of communication: maps showing the ancient trade-routes, and economic, geological, and vegetation maps of the country. Part III. comprises a series of sixteen sheets of maps showing Palestine at different periods in the history of Israel, with plans of Jerusalem at various periods, including one of the city as it is at the present time. Part IV. deals with the Christian Era, and contains twelve maps, amongst which are Eastern Mediterranean, to illustrate St. Paul's Travels; Asia Minor showing positions of the Seven Churches; the Church and Empire of the East under Trajan and Constantine; Palestine in the Fourth Century; copy of the section of Peutinger Tables dealing with Palestine; the expansion of Christianity; Christian Missions in Palestine; and several others of an equally interesting character.

Preceding the maps are twenty-five pages of notes on the maps with explanatory bibliography, and following them a good general index to place-names. The atlas measures 9½ × 15 inches.

Java. **Topographical Bureau, The Hague.**

Topographische Kaart der Afdeelingen Tegal, Brebes en Pemalang van de Residentie Pekalongan. Scale 1:100,000 or 1 inch to 1·59 stat. miles. Two sheets each

26 by 20 inches. Topographische Kaart der Afdelingen Pekalongan en Batang van de Residentie Pekalongan. Scale 1 : 100,000 or 1 inch to 1·59 stat. miles. Size 20 by 26 inches. The Hague: Topographical Bureau, 1914.

A portfolio containing a new edition of the map of the Pekalongan and Barking divisions which appeared some years ago, and another map in two sheets of the Tegal, Brebes and Pemalang divisions of Pekalongan. Both maps are on the scale of 1 : 100,000. Relief is represented, as is common with all of these maps, by hachures, and the vegetation and plantations are distinguished by superimposed tints, some of which are rather unnecessarily dark. The maps show a considerable amount of detailed information as to means of communication and character of towns and villages.

Madura. **Topographical Bureau, The Hague.**

Topographische Kaart der Residentie Madoera. Scale 1 : 100,000 or 1 inch to 1·59 stat. miles. Three sheets, each 21 by 28 inches. The Hague: Topographical Bureau, 1914.

A map of the island of Madoera in three sheets, showing relief by vertical hachures, and a considerable amount of detailed information concerning means of communication and the character of towns, villages, and ports. The special feature of the map is the careful manner in which the surface features of the island, such as bush, sand, etc., are represented by various tints.

AMERICA.

United States. **U.S. Geological Survey.**

United States. Scale 1 : 2,500,000 or 1 inch to 39·45 stat. miles. Two sheets, each 76 by 49 inches. Washington: Dept., the Interior, U.S. Geological Survey, 1914. *Presented by the Director of the U.S. Geological Survey.*

New editions of two useful general maps of the United States, showing boundaries, railways, and towns in black and rivers blue. State boundaries have a neutral tint in addition to the black lines. In one style in which the map is published contour lines are given in brown at 500-feet interval up to 2000 feet, and after that at 1000-feet interval. In addition, on the low land, the 100-feet contour is laid down. The contour intervals are not stated, and it would be an advantage if many more lines were numbered. The map is clearly drawn, and in its earlier editions has already proved of considerable value.

PHOTOGRAPHS.

South America. **Walter.**

Two photographs of the Iguazu Falls between Argentine and Brazil, and five of the Kaieteur Falls, British Guiana, taken by Mrs. Arthur F. Walter. 1914. *Presented by Mrs. Arthur F. Walter.* 1915.

The Iguazo Falls are on the River Iguazo, a tributary of the Parana which forms the boundary between Brazil and the territory of Misiones in Argentina; and the Kaieteur falls are on the Potaro, which flows into the Essequibo River of British Guiana from the west. Both are extremely beautiful and would doubtless be better known than they are if they were more readily accessible. The photographs were evidently taken from carefully selected points, and they form an interesting set. They measure 6 by 4½ inches.

(1 and 2) Two photographs of the Iguazu Falls, 210 feet high, on the Alto Parana; (3) Kaieteur Fall, 822 feet high; (4) Kaieteur Fall, 822 feet high, 370 feet across top; (5 and 6) Kaieteur Falls, showing cavern behind; (7) Head of Kaieteur on Potaro River.

N.B.—It would greatly add to the value of the collection of Photographs which have been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.

Maps to illustrate

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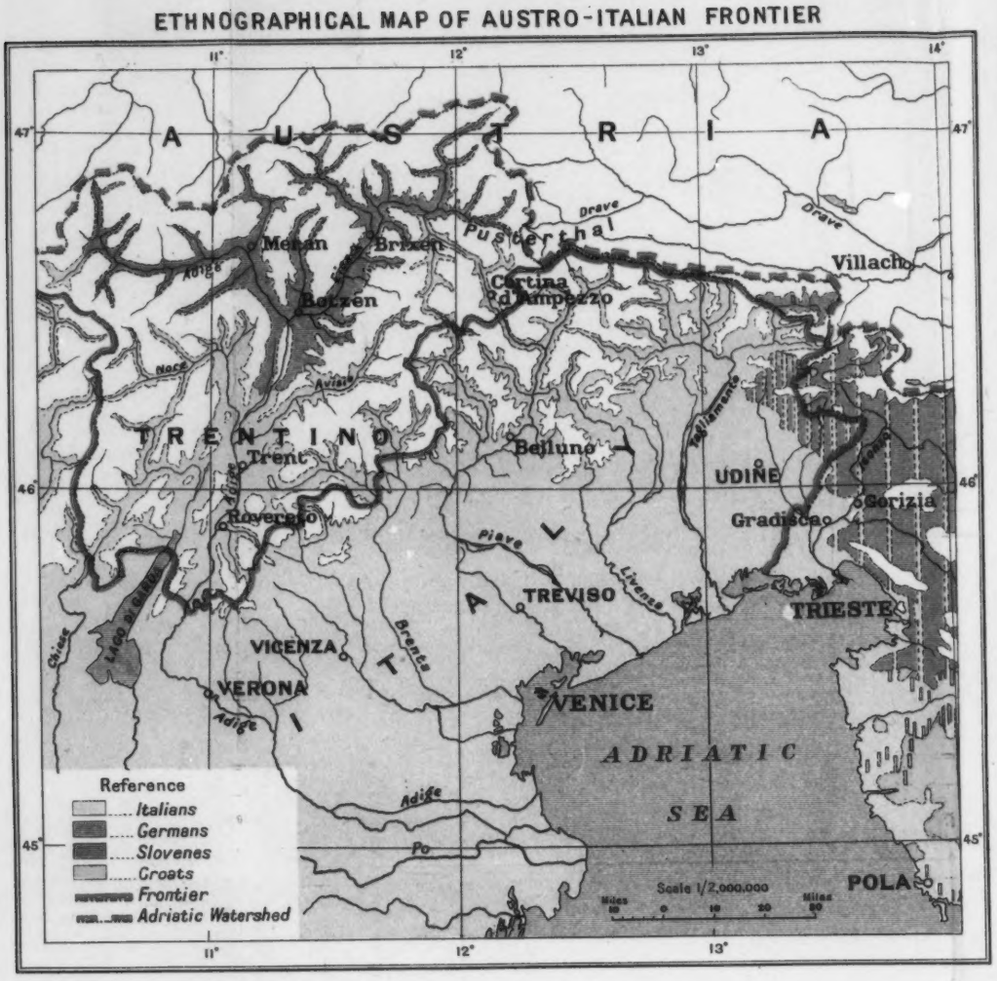
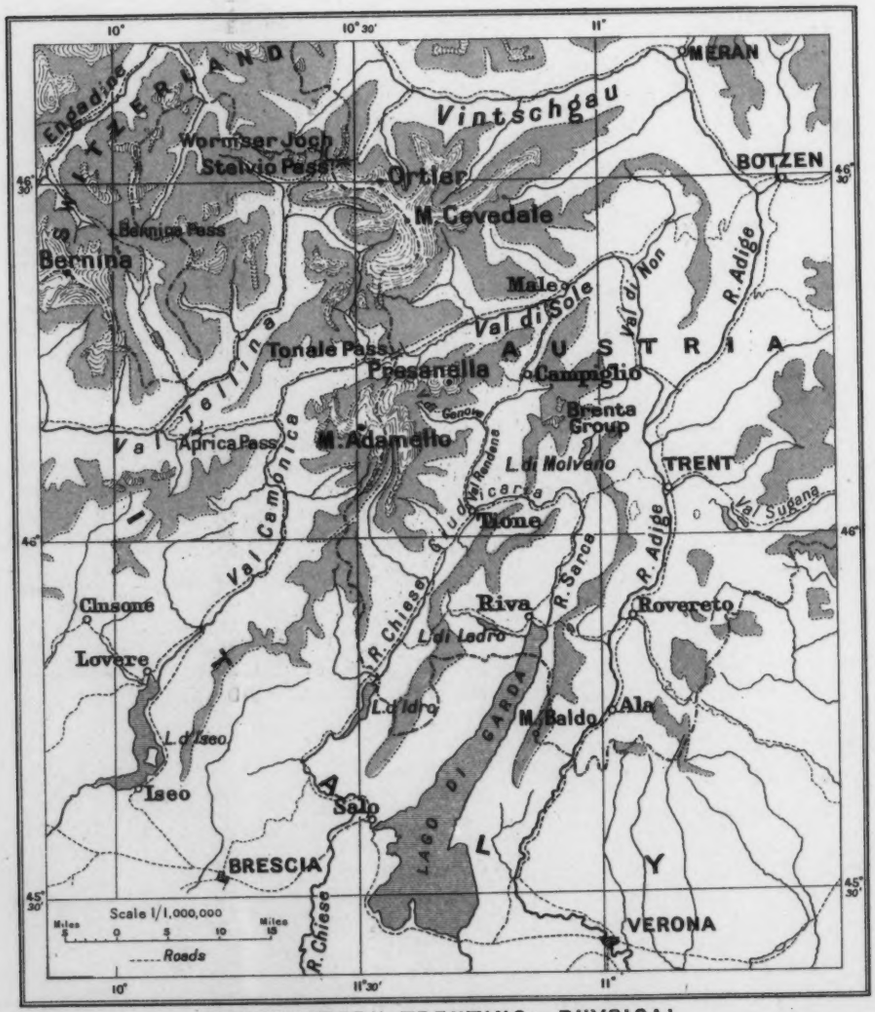
BY DOUGLAS W.

ETHNOGRAPHICAL MAP OF AUSTRO-ITALIAN FRONTIER





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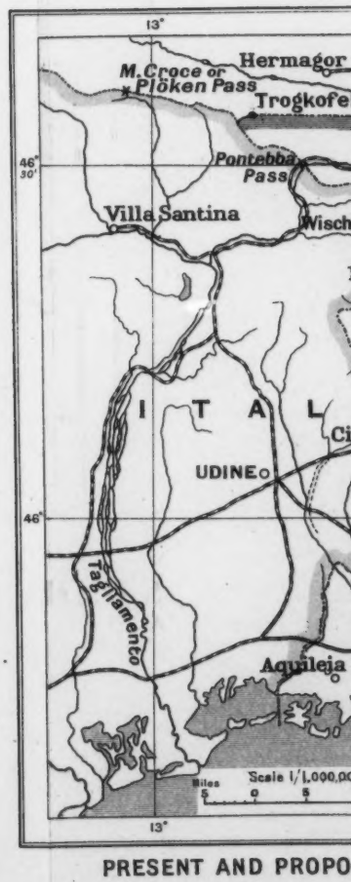

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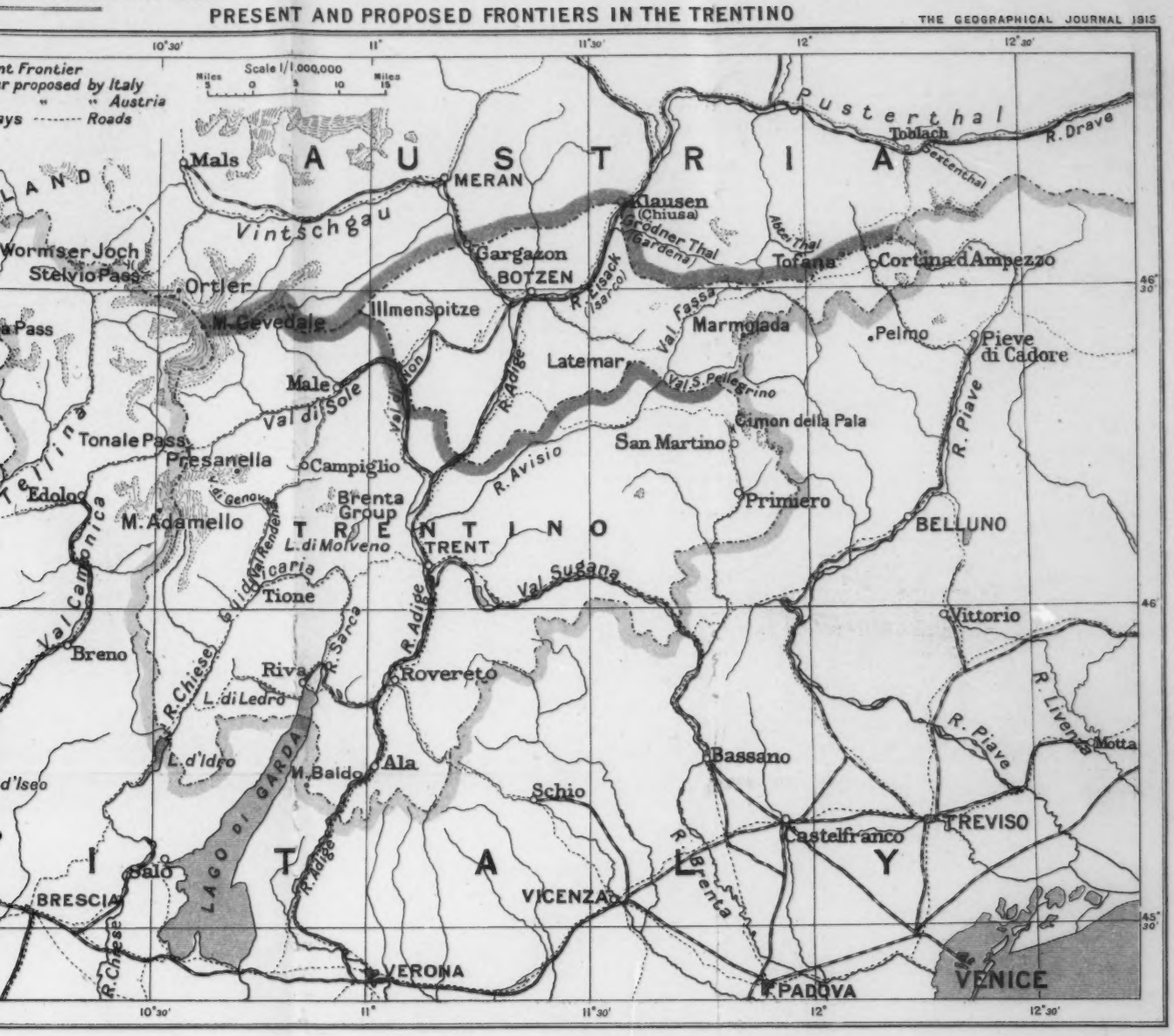

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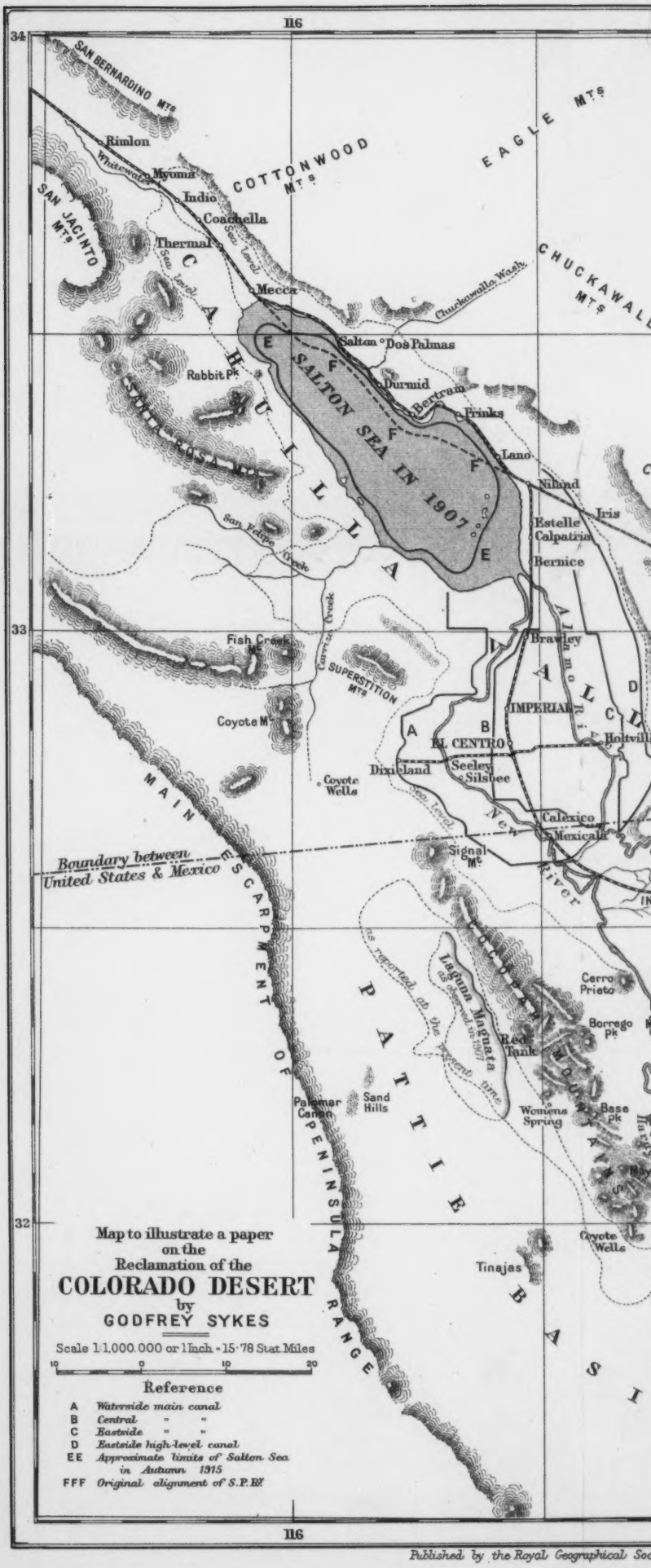

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